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The Psychology of Thinking

THE PSYCHOLOGY OF THINKING

W. Edgar Vinacke, Ph.D.

Associate Professor of Psychology
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New York Toronto London

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*To my wife Winifred
and daughter Susan*

PREFACE

This book represents an attempt to survey in a systematic fashion the variety of human thought processes, together with what the psychologist has found out about them. The author has not been guided by a preference for any particular species of theory. It is his opinion that many different persons, regardless of their theoretical positions, have been studying the same phenomena. For this reason, an effort has usually been made to relate theories to one another, rather than to choose among them. At some points, to be sure, an evaluation of the available evidence has led the author to indicate a preference for one position rather than another.

More confidence has been placed in the data of experimental studies than in speculation about the results. At the present stage of our knowledge, we are more in a position to describe than to explain. This condition is especially true in the study of thinking, which has lagged well behind other branches of psychology as far as systematic investigation goes. The reasons for this comparative underdevelopment, as we shall see, reside in the great difficulty of studying thinking and in the lack of integration among theories about the manifestations of thinking. As a first step toward overcoming these obstacles, considerable space is devoted to clarification of methodological problems. In several strategic places, furthermore, the author has tried to formulate questions which need to be answered and to suggest possible directions which might lead to their answers.

Throughout the book, there is a deliberate stress upon the phenomena of human thinking. To this end, very few references are made to experiments with animal subjects. This selection should not be taken to signify that the author regards such studies as irrelevant or useless. Indeed, every student of psychology knows that many fruitful hypotheses have originated in the observation of rats, dogs, monkeys, and other animals. In choosing material for inclusion, however, it was simply decided to confine the discussion to data with immediate value in revealing the processes of human thinking.

Another primary focus of attention is evident in the emphasis on *normal* thinking. Again, there is no intention to slight the great body of excellent literature on abnormal variations in mental activity. The selection is partly based on the necessity for limiting the book in some direction. It

is also influenced by the fact that many thorough treatises on disorders of thinking are already available

A third area of exclusion is apparent in the lack of an extended treatment of the products of human thinking, as contained in scientific theories, literature and the arts, and the general encyclopedia of human knowledge. To deal with the broad and absorbing questions arising in contemplation of these fields would be to exceed the purpose of the present book, which is concerned with how this knowledge and its use comes about rather than with the knowledge itself.

Still one more characteristic of the book should be mentioned. The trained psychological reader will notice that somewhat arbitrary distinctions are made between thinking, perception, learning, and other aspects of behavior. They are made for convenience only, merely in the interest of keeping the book within reasonable limits and for the purpose of directing attention to certain problems rather than to others. In the long run we are concerned with understanding the complete pattern of behavior of the total organism. To achieve this end it is often necessary to concentrate on a relatively limited group of problems in the total matrix of behavior.

Within the scope thus outlined the book falls naturally into four sections. It first takes up topics associated with the historical background of the psychology of thinking, then considers phenomena conventionally called 'reasoning,' follows this with a discussion of imaginative processes, and concludes with a treatment of regulating, or "personalizing," functions in thought.

A number of excellent books and monographs have been written on various aspects of the psychology of thinking—especially on problem solving. Some of these present extensive research and important hypotheses, not all of which could be included in detail. Most of the source material, as is so often the case in psychology, has been culled from the journals and monograph series.

In organizing the available materials, the author's policy has been to err on the side of too much rather than too little. His principal justification lies in his belief that the whole field must be defined before it can be narrowed to the most important points. It seemed worth-while to get all the data into one place first and to leave to the future the task of refining them beyond what has been possible here. At the same time, the book is designed to be more than a compendium. Much effort was expended to achieve coherent organization and to relate each investigation to some clearly recognizable principle or question.

The book was written for the serious student of psychology. It is not a handbook on how to think better or an index to the thoughts of others.

There is value in producing works of these kinds, and some excellent ones have been written. In the present instance, however, the aim is to forward the systematic and objective study of mental processes as an area of vital scientific interest.

Perforce, much of the material is elementary, but, even so, its presence in this book may serve as a reminder that questions remain to be answered. Some of the sections, to be sure, are elementary because that is in fact the status of investigation in those directions. To survey adequately the whole subject, it was necessary to make use of whatever investigations and theories were available. Some aspects of the psychology of thinking have benefited more than others from sound research. Better balance will be possible when more research has been conducted. For all that, the book would never have been written if the writer was not convinced that noteworthy strides have been taken toward a bona fide psychology of thinking.

For what it is worth, therefore, this book is offered as an introduction to problems of immense moment in the behavior of the human being. If it can serve as a stimulus to worth while investigation, it will have as much value as can be expected. If it induces renewed effort toward the systematic formulation of theory, that too will be ample reward.

The book has profited from the helpful advice of a number of colleagues. It is a pleasure to acknowledge the valuable comments of Dr. Leslie Briggs, who read Chapters 2 through 11, of Dr. Harold McCarthy, who read Chapter 6, of Dr. Colin Herrick, who read Chapters 10 through 16, and of Dr. Clarence Glick, who read Chapter 14. The staff of the University of Hawaii library gave invaluable assistance, with invariable courtesy, in obtaining needed articles and books. Mrs. Violet Borges, Miss Patsy Okumura, and the staff of the university stenographic pool performed wonders of speed and accuracy in typing the manuscript. Finally, the author owes a debt to the University Research Committee for granting a reduction in teaching during the period of writing the book.

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Chapter 1. INTRODUCTION

WHAT IS THINKING?

Thinking has been described as a purely human characteristic—as the marvelous property which distinguishes man from the lower animals. In point of cold fact, however, it is doubtful whether this complacent attitude is justified. Experiments with animals have shown that they, too, display the characteristics of behavior which we include under the heading of “thinking.” It is true that, in all animals except man, this behavior is very much more simple than it is in man. Nevertheless, it should be remembered that thinking—or its rudiments—is present over the entire scale of animal life, so that its most complex culmination in man is a matter of degree rather than of kind.

At the same time, it would be misleading to postulate a continuum, with man simply one stage beyond the next most highly developed species. Rather, man has evolved well beyond that point, partly because his characteristics have enabled him to develop ever-increasing complexities of thought, partly because the intermediate, or “missing,” links have dropped out and thus do not appear on the scale. It will be our problem in this book to examine human thinking, which in the sense just defined represents the culmination of a very long and fascinating development in the history of life. Since our concern is with the human being, we shall borrow from the enormous experimental evidence that animals think, primarily at points where the experiments have direct significance for the understanding of human thinking.

The same factors distinguish man from lower animals with respect to thinking as distinguish him with respect to evolution. Among these, of the greatest importance is the development of the brain. This statement is not intended to imply that other factors are not of immense importance also. For example, we shall see how incalculably important are the language mechanisms and the prolonged plasticity of the infant. It is nevertheless the tremendously increased size and complexity of the brain which has made human thinking so complex. This development has made the understanding of human thinking very difficult. It is well to realize at the outset that we can answer satisfactorily only a few of the innumerable and profound questions which arise in the study of human thinking.

In no other field of psychology can an investigator find more puzzling fields for research, or encounter more challenging difficulties in his way

SOME PRELIMINARY CONSIDERATIONS

Before we proceed any farther, it is necessary to clarify what the psychologist means by the term "thinking." As in many other connections, the psychologist encounters here the psychology of everyday life, from which he has inherited many terms lacking precise and objective meaning.

This common-sense view of thinking refers to reflection or meditation, to belief, opinion, or judgment, or to fancy. In general, it seems to signify "something that goes on in the mind." Thus the term has no definite meaning, in large part, perhaps, because the processes involved in it are so elusive and, apparently, incapable of direct observation. Furthermore, although thinking activity occurs in everyone, relatively few persons think about thinking, and, of course, still fewer actually conduct objective experiments.

One psychological definition states that thinking is "any non-perceptual process or activity not predominantly perceptual by which one apprehends an object or some aspect of an object or situation" (1).¹ At first glance, this definition is hardly more satisfactory than the common-sense view. However, it affords certain preliminary clues, which may be stated as follows:

1 *Nonperceptual* Thinking involves at least some processes and components which are not derived from, or do not deal with, objects present in the immediate environment. The problem of what these factors are, and how they operate, is one which will occupy a great deal of our attention.

2 *Relation to Other Aspects of Behavior* Thinking is not predominantly perceptual. In other words, thinking is not separate and independent of other behavioral processes. When an individual deals with the external world, or perceives, he is also thinking, and when he is thinking, he is also perceiving. We shall find continually not only that perceiving and thinking are interrelated processes, but also that emotion, motivation, learning, and other aspects of behavior enter into thinking. In the last analysis, all attempts to subdivide behavior into categories are artificial. The organism is an interrelated whole, with each process in dynamic relation to each other process, sometimes directly, sometimes indirectly. In this book, we shall merely concentrate on certain aspects of this total behavior, but without intending to cut them off from their proper rela-

¹ Parenthetical numbers in the text refer to corresponding numbered items in the reference section following each chapter.

tion to the whole. The aspects with which we shall deal are not so directly dependent upon the occurrence of an immediate stimulus having specifically given properties as is the case in activities labeled 'perceptual,' and they are influenced by all the events occurring in the behavior of the organism.

3 *Role of Past Experience* Thinking involves the apprehension and manipulation of objects, the application of properties of objects and situations, but not solely in terms of perceptions at the present moment. The previous experience of the individual has a more or less permanent effect, not completely chaotic, but more or less organized. It is the re-appearance or effect in some way of this prior learning which is the central concern of the psychology of thinking. Part of our task, therefore, is to explain systematically the role of past experience in the behavior of the human being.

Traditionally, psychologists have attempted to define thinking by subdividing the total process and then defining these categories in somewhat abstract terms. The two broadest subdivisions customarily given are *reasoning* and *imagination*. The former is said to occur when a problem presented to the individual is solved by a series of symbolic activities, *i.e.*, when the solution depends at least in part upon data not immediately available in the environment. This process has often been termed "mental exploration." Imagination, in contrast, is sometimes said to be "mental manipulation," or the combining and recombining of parts of past experience. Actually, such a distinction is quite artificial, for it can only be maintained by oversimplification and abstraction. As we shall see, both reasoning and imagination involve problems, symbolic functions, and the combining and recombining of past experience, in all probability, they are, indeed, activities of the same tissues. The important differences are in the situations in which they occur and in the degree and kind of control over them. Thus reasoning more than imagination has usually, a distinct and identifiable beginning and end, is more closely related to the external world of reality, and is more subject to those selective and regulative systems about which much more will be said later. Imagination by contrast, is relatively less subject to the demands of immediate reality and to the controls which link the individual adequately to it. It is more a response to internal-need states. In moment-to-moment behavior, however, mental processes vary between the external (reality) and internal (need) poles, rather than being sharply one or the other. Creative thinking, according to present evidence, can be described as an especially striking instance of this relationship.

Distinctions of this kind are drawn on the basis of the *kind* of thinking which goes on under different conditions or in different situations. But

thinking is always subject to the properties of the mental organization of the particular individual who is thinking, that is to say, it is *personalized*, or shaped by the selective and regulative systems which are established during the learning process. Such systems determine how stimuli will be interpreted, how previous experience will be brought into relation to current behavior, and what covert or overt response will be made. In order adequately to describe and explain thinking, therefore, attention must be devoted to the systems of mental organization which personalize thinking. In this book, these systems are called "concepts," "attitudes," "sets," "traits," and "motives."

There is another important way to consider the question of what thinking is, and that is in terms of its biological nature. In this respect, thinking may be regarded as the activity of nervous centers, particularly the higher centers of the brain. Thus we may contrast thinking with emotion, bodily movement, vegetative functions, etc., as well as with perception.

At least four aspects of the activity of higher brain centers are related to thinking.

1 Processes Which Intervene between the Stimulus and the Response

The nervous system is so constructed that at least two neurons are involved in every response of the organism, a sensory nerve pathway leading from a sensory ending to a nerve center, and a motor nerve leading from a nerve center to a muscle or gland. The very simplest neuron arc, whereby a simple reflex occurs, may involve just two neurons, without any intervening processes, for instance, a spinal reflex such as the knee jerk is of this kind (3, pp 39ff). To be sure, even so simple a response does not occur independently of the total activity of the organism, thus it may be influenced by, and may influence, other behavior processes by means of other neurons. Clenching one's fist will facilitate the knee jerk. However, in most instances of human behavior, the situation is infinitely more complex. The sensory impulse travels along the sensory nerve to a nerve center, where it may be transmitted along many other neurons or initiate a complicated pattern of nervous activity, before it ultimately reaches the motor nerve along which it travels to the muscle. The mental process is the activity of these nerve pathways between the sensory neuron and the motor neuron, that is, the activity occurring in the association pathways. Referring to what was said above about thinking and perception, it is evident that the distinction between them breaks down even more, for where in the total mental process the perception ends and the thought begins it is impossible to say, other than in descriptive terms.

2 Context What we have said about association pathways is really too simple. There is another aspect of brain activity which relates to think-

ing, namely, the fact that a mental process occurs in the midst, so to speak, of a complex pattern of nervous activity. Sensory impulses enter the brain continually from many different receptors, the process of muscular coordination is going on, the regulation of various organic and emotional activities continues, other parts of the brain tissue not directly concerned with any of these operations are active, e g, the memory functions discussed below. A present mental process, then, is simply a small part of this pattern and can occur only in terms of what else is occurring at the same time. This continually shifting pattern constitutes what might be called the "mental context", it is a factor of incalculable importance in thinking. The field theory of the gestalt psychologists provides us with the clearest formulation we have of the probable nature of this context.

3 *Determining Tendencies* Still another aspect of brain activity has to do with the fact that behavior does not occur in a random or chance fashion. Mental processes are somehow directed. There are internal dynamic regulative systems (the personalizing systems mentioned above), set up in large part, if not entirely, by the brain centers. Later on, experiments will be reported which show why it is possible to speak of determining tendencies, despite the fact that they cannot be observed directly. At present, we shall simply point out that our actions, thoughts, even our dreams, are organized, shaped, and integrated by some kind of internal system.

4 *Matrix of Experience* The brain centers also contain the traces of past experience. There are at least three ways in which such traces influence the course of thinking. First, there is the obvious role of what we ordinarily mean by "memory," that is, the conscious recall of past experiences and the application of habits and skills, where the latent traces of experience are reactivated in the course of thinking. Second, there is a function of an unconscious sort, part of what was called "context," that is, the vast background, or matrix of experience, against which a current mental process occurs. [This matrix corresponds in part with "mneme," as Stern uses the term (5).] Finally, a third function is represented by the repressed, but still active, components of past experience. Really, the repressed factors are also a part of the mental context, they, however, may be conceived of as being active and exerting a stronger influence on thinking than other aspects of the context (see Chapter 3). All three of these memory functions are mediated by determining tendencies. Further, none of these four aspects of brain function is to be regarded as a process or entity, separate from the others. They are merely constructs, formulated to explain four characteristics of the same total process, which itself cannot be directly observed. Actually, one cannot, at present, know what the nature of these functions is, nor whether

different mechanisms are responsible for them. Probably they are interrelated in an intricate way, as suggested by the field theory.

THINKING AS BEHAVIOR

In general, thinking serves in the adjustment of the organism to its environment, both internal and external. Thinking can occur as a response to an inner need or as a response to a problem arising in the external world. Since both these instigators are continually present, though shifting, we can say that the human being is always thinking. From moment to moment, of course, the quantity and nature of thinking changes, in accordance with the varying adjustments required. The relationship between external stimulus and inner need is always close, the one influencing and modifying the other. Even during sleep, when thinking is ordinarily at a very low quantitative level, the mental activity of the individual is influenced by the interrelationship of external factors and need. Sleep may also illustrate the fact that external stimuli and internal need do not always have, if they ever do, an equal effect. Dreaming is most often a response to inner needs, with external factors usually, though not always, of much less importance (see Chapter 11). During the working day, however, there are long periods when the world of external reality plays a greater role than inner needs. (Note that, even during the day, there are periods when thinking is dominated by inner need, some such periods are fairly predictable, as in the case of hunger, and others comparatively unpredictable, as in the case of anxiety.)

As behavior, thinking always occurs in response to some stimulus, whether that stimulus is directly observable or not. That is, the external world influences the course of thinking directly by way of the exteroceptors and indirectly through the various learning and memory functions. As response to need, thinking is also a response to stimuli, again directly, in the case of a present need, or indirectly, in the case of a persisting or repressed need, the stimuli associated with internal needs originate in the interoceptors² or in changes in the biochemical constitution.

The nature of the external stimulus or of the need, or, more typically, of both in combination, determines the nature of the mental activity. If no particular response is required or possible, the thinking may be called "imagination," whereas the more or less controlled mental activity which follows the presentation of a problem originating in the environment

²The remaining class of receptors, what have been called 'proprioceptors,' have in relation to thinking a role which is both in the nature of external stimulus (the movement of body parts for example) and of internal need (the maintenance of postures for example). The kinesthetic sense also has another vital significance for thinking (see Chap. 5).

may be called "problem solving" or "reasoning." In addition, there are those aspects of thinking referred to above as "personalizing processes," as evident in the expression of an opinion or in the operation of a prejudice. In this case, mental activity, though occurring in response to external stimuli, is in large part, or entirely, predetermined by already established mental mechanisms, without requiring much, if any, of the reorganization of past experience evident in reasoning and imagination. But this latter distinction, also, is too simple, for both problem solving and imagination have personalized characteristics.

As behavior, then, thinking can fruitfully be treated in terms of adjustment. It is the internal processes which bring the organization laid down in past learning to bear upon response to current situations, and which shape those responses in keeping with inner needs (2, 4). All the conditions characterizing these three determinants—the current situation, the context of past experience, and the inner need state—are therefore pertinent to an understanding of thinking. It will be necessary to consider these conditions in detail as we go along.

REASONS FOR STUDYING THINKING

The psychologist has a special interest in thinking, because as a scientist he seeks to understand human behavior, regardless of whether or not some practical application of this understanding results. Since thinking is one aspect of human behavior, the psychologist studies it and develops theories about it, just as he studies the sense organs or the emotions. In this sense, the psychologist may be quite content to plan and conduct experiments dealing with thought processes, merely because an interesting and baffling question has occurred to him.

Beyond this research interest, the psychologist may attempt to use the knowledge of thought processes to predict and control behavior—goals which are frequently cited as the major tasks of psychology, rather than merely the description of behavior. It is true in fact, that research in the psychology of thinking has many possibilities for predicting and controlling behavior. We shall find instances of this in relation to problem solving, creative processes, and stereotyping and prejudice, and in many other connections.

With respect to the prediction and control of behavior, there is a tremendous need for understanding human thinking and for applying that knowledge. Today, the world is faced with staggering problems of interpersonal and intergroup relationships. The shrinking of the world, with which everyone is acquainted, because of swift communication, enormous strides in industrialization which promote the exchange of information and goods, and the struggle to establish a world government, have

emphasized the necessity for mutual understanding. It is imperative that no one assume that everyone thinks the same as we do, or that Russians think the way Americans do and vice versa. At the same time, it is equally imperative that such basic processes as do exist, despite differences in the results to which they lead, be discovered and formulated. Interpersonal and intergroup relationships are nowhere so profoundly important, and so easily misunderstood, as in the realm of thought processes. These are grave problems indeed, and it is to be hoped that progress can be made in approaching a solution to them.

DIVISIONS OF THE SUBJECT

It will be our task in the chapters that follow to consider first the general background of human thinking, with particular effort directed toward a preliminary analysis of the mechanism which makes thought possible.

We shall then consider in turn three broad aspects of the total thinking process. For the first of these we shall use the general term "reasoning," where attention will be given to logic, concept formation, transfer of training, and problem solving.

Next, we shall discuss imagination, in which section are included imagination in general, autistic forms of thinking, and creative processes.

Finally, we shall consider personalized thinking, including the internalization of experience, personalized aspects of thinking, attitudes, prejudice, and stereotyping, and public aspects of personalized thinking, such as opinion, propaganda, and rumor.

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Chapter 2. HISTORICAL BACKGROUND

Before plunging directly into a discussion of the modern understanding of the thought processes, it is necessary to indicate, briefly, some of the historical trends which precede it. However, we shall not present a detailed survey, there are admirable sources elsewhere for this information.¹ It cannot be too strongly emphasized that the psychologist needs to have a good background in the history of philosophy and science, out of which psychology has emerged. Otherwise, he is incapable of evaluating "new" ideas, which may, in fact, not be new at all, but, beyond such errors, which even a knowledge of history cannot totally prevent, his outlook without this background must be limited to fads of the day, with all that that signifies in paucity of ideas.

BEGINNINGS OF SYSTEMATIC ANALYSIS OF THINKING

Man has always been interested in psychology, at least in the practical sense of attempting to explain his relationship to the external world. Although the earliest efforts in this direction are scarcely recognizable to us today as psychology, the problem of thought processes has always been basic to psychology, primitive or otherwise. That is the evolution of the ability to think inevitably led to a need to think about thinking itself.

Prior to recorded philosophy—in Western cultures, it is Greek philosophy from which the development of modern knowledge in all fields is traced—the conception of mind existed in the form of "animism," or a belief that all things possess souls. No doubt a great deal was known about what we would call "common-sense psychology," but very little about how and why behavior occurs, except through reference to a conscious principle, or soul.

Gradually, however, Greek philosophers, beginning in the fifth century B.C., began to deal more objectively and definitely with problems of knowing, in addition to those of reality and theology. They thought and

¹ Sources for the history of psychology upon which the following sections are based are G. S. Brett's *History of Psychology* (2), which treats the subject principally from the philosophical standpoint and his *Psychology, Ancient and Modern* (3), G. Murphy's *An Historical Introduction to Modern Psychology* (5), E. G. Boring's *A History of Experimental Psychology* (1), and J. C. Flugel's *A Hundred Years of Psychology* (4).

wrote extensively about essentially the same areas of psychology which concern us today, although it was not called psychology in our sense of the word.² Thus theories were advanced dealing with sensation and perception, feelings and emotions, creative processes, memory, reasoning, and imagination. This development reached its culmination in the monumental works of those remarkable men, Plato and Aristotle. They have had a dominant influence on Western thought for some thirteen hundred years, and their legacy is by no means exhausted yet. Of course, this has had harmful effects as well as good, because there is a tendency to find answers in this ancient literature instead of striking out in new directions.

The Greek psychologists were engrossed with a problem which becomes more fascinating the further one pursues it. It is the problem of "how the outer world produces the inner perception of that world" (3, p. 18) and, one might add, the converse of this question. Modern psychology, too, is vitally concerned with this same problem, although our conclusions are in many respects very different from those of the Greeks. Perhaps the chief reason why their interpretations sound so naive, speculative, and inadequate to us is that they lacked the knowledge of physiology and the nervous system which we now take for granted. Nevertheless, Alcmaeon of Crotona (550-500 B.C.) is alleged to have performed dissections which led him to assert that there is a connection between the brain and conscious life. At any rate, the Greek thinkers made a distinction between the mind and the body which has persisted to this day.

For our present purpose, we may point out three features of Greek theory relevant to the psychology of thinking.

In the first place, they attempted to explain the influence of the outer world upon the individual by means of sensation. Aristotle, for example, defined sensation in terms of the power of discrimination between parts of the environment, a factor which is significant for the adaptation of the organism to its environment. Sensation is accomplished by movements of the *pneuma*, which transmits an impression of an object to the mind. The *pneuma*, apparently, was conceived to be a medium permeating every part of the body, akin to the notion of "animal spirits," in which form the doctrine persisted until very recently.

The senses have a meeting place, or "common sense," which Aristotle located in the heart. The common sense is the center in which movements of the *pneuma* are unified and combined or, in modern terms, integrated into the total activity of the mind. It may be noted that imagination was to Aristotle an aftereffect, or fainter and less active remnant, of the sense impression. This conception is very similar to the "image" of

² Yet Aristotle wrote a treatise specifically concerned with psychology, the *De anima*.

the structuralist psychologists, represented in America principally by E. B. Titchener, in the early part of the present century.

In the second place, the Greek psychologists formulated rather elaborate theories of mental processes. These theories are derived from logical systematization based on introspection, rather than from empirical evidence in the modern sense. Plato describes memory as the preservation of sense impressions, in which terms it is practically equivalent to consciousness. He adds to the usual memory functions one of reminiscence, which is a property of the soul in knowing (or recalling) experiences not actually derived from the senses. Experiences of goodness and beauty, *i. e.*, abstract ideas, are thus accounted for. Imagination is mental activity in sensuous form, accompanying sensation, memory, and other mental processes. In general, the mind has many functions arranged in logical fashion from low to high. It differs from sensation because it deals with objects not sensibly present. Plato also seems to have recognized phenomena which we would call "unconscious," although he does not clearly formulate them.

Aristotle's conception of the mind rests upon the basic idea of motion. One might say that mental processes are inner motions which persist after initial stimulation through the senses. Images, as noted above, are fainter replicas of the sensation. Memory is a kind of storing up of sensory motions, and recollection as an active process is the stirring up of a train of imagination. Imagination is thus basic to all thinking. Plato had stated laws of association to account for the nature of memory, and Aristotle carried these principles forward in his own psychology. The principles of similarity, dissimilarity, and contiguity, beginning in ancient Greek theory, were developed in full force by the British associationists more than fifteen hundred years later, indeed, they still hold an important place in psychology. The highest form of mental life is reasoning, which utilizes material from the senses and imagination but goes far beyond them into the realm of pure ideas. Finally, Aristotle recognizes clearly the interdependence of sensory, conative, and affective factors in behavior, just as we are doing increasingly today.

In the third place, we must emphasize another important feature of this ancient psychology. It separated the mind, or soul, from the body and divided the former into distinct parts, ascribing to it an independent existence. Each of these parts was given definite functions, or faculties. In the case of the highest, or rational, soul, these faculties were thinking, understanding, belief, conjecture, etc. Here, again, the influence of Greek psychology has persisted down to the present day, for the faculty psychology of modern times has not died, despite conclusive experiments to disprove it.

Between the period of Greek scholarship and the Renaissance, little advance was made in the study of psychology. It was a period of gradually evolving religious doctrines (such as speculations about the soul) in the Western world, and of mathematics in the Arabic countries. Mathematics was hardly known in the Western world until the Crusades opened the doors of the East. Indeed, much of the classical writings of the Greek and Latin scholars was not known until after that time. Then, in increasing tempo, developed the stupendous trends in philosophy and science leading to modern times. E. G. Boring (1) has portrayed these events in masterful fashion. For a detailed discussion the reader should consult his book. Within the scope of the present work it is neither possible nor desirable to give a complete review. Instead, we shall present, briefly, the major lines of development leading ultimately to the objective analysis of thinking with which we shall be concerned.

PHILOSOPHY AND THE MIND BODY PROBLEM

The first of these historical sequences centered around the endless question of the relationship between the mind and the body. The question arose because there seemed to be a difference between the mental and the physical. For example, an apple hanging on a branch was clearly a material object, whereas an apple in the mind, no less an apple, nevertheless could not, apparently, be a material apple. Looking further, the body itself, represented in the foregoing example by the brain tissues in which the mental apple occurred, seemed to be different from the idea of the apple. Under such common-sense considerations, it was easy to suppose that the physical apple and the mental apple belonged to different modes of reality. To this end, matter and mind were postulated, each with its own properties. Next, it became logically necessary to inquire whether one could influence the other and, if so, how. There were many possible answers to this question, and each had its adherents in the history of philosophy, with numerous variations. Descartes, in the first half of the seventeenth century, formulated a dualistic theory completely separating the mind from the body, but he thought that they interacted in the pineal gland. Spinoza (1665) stated that mind and body are but different aspects of a single universal principle, God ("double aspect" theory). Leibnitz (1695) formulated another dualistic theory, a form of parallelism, according to which mind and body are not causally related but function simultaneously, in a harmonious manner. Locke (1690) developed an empiricist theory in which he accounted for ideas by saying that they are produced from experience rather than being innate. This position was developed more extremely by Berkeley (1710), who specified mind as the ultimate reality which generates matter.

This problem has been taken up repeatedly to the present day. It has usually been solved through the statement of what has been called "psychophysical parallelism." This explanation, in various forms, assumes that mental and bodily (*i.e.*, brain) events constitute two parallel series and occur simultaneously. They are simply different aspects of the same phenomena which can be studied from either standpoint.

Although these treatments of the nature of mental processes were philosophical, they represented a long step forward on the road to modern psychology, because they showed a preoccupation with aspects of behavior which could not be explained in mystical or theological terms but had to be accounted for in known terms (or at least logical terms), as far as that was possible. The next step forward was made by the British associationist philosophers, who, although not psychologists in the modern sense, laid important groundwork for psychology.

ASSOCIATIONISM

The associationists, although they continued to write about the mind-body problem, occupied themselves with explaining how the mind works. In general, they dealt with the contents of the mind and how these elements are organized in accounting for mental processes. Although associationism, as noted above, goes back to the Greek philosophers, it owes its modern history to John Locke and its exposition as a system of psychology to David Hartley.

John Locke stated that mental processes are composed of "ideas" derived from sensation and reflection (a sort of inner sense). He described the various qualities which ideas may have and explained that ideas are combined to form complex experience through association. David Hume (1739) further developed this theory by drawing a distinction between impressions and ideas, the latter corresponding to the more modern concepts of idea and image and the former corresponding to sensation and perception (1, p. 189). Both these forms of mental content may be either simple or complex. He accounted for memory and imagination by formulating two laws of association, resemblance (or similarity) and contiguity (in place or time). These laws are familiar to all psychologists.

It was Hartley, however, who took the thesis which Locke had advanced and elaborated it into a whole system. He reduced the principles of association to the law of contiguity and made allowance for the fact that ideas can become linked through either simultaneous or successive association. We would recognize much of this discussion today as an effort to deal with the acquisition and use of experience—or the field of learning, remembering, and reasoning.

Later associationists elaborated the doctrine further and modified it in

various directions. For instance, Thomas Brown added to the primary laws a series of secondary principles which deal explicitly with memory and recognize the influence of bodily, individual, and environmental conditions upon mental processes. James Mill treated a great variety of psychological subjects, the basis for which has been called "mental mechanics." His fundamental principle was the law of contiguity. His son John Stuart Mill ultimately formulated four laws of association—similarity, contiguity, frequency, and inseparability. He did not, however, unlike his predecessors, conceive them as independent principles. On the contrary, he regarded them as aspects of the general principle of association (1, p. 216). Perhaps he regarded them as conditions under which ideas may become associated rather than as logical, mechanical laws. His associationism has been called "mental chemistry," since he described the fusion of ideas into more complex structures. He also anticipated the extremely important concept of "imageless thought," with which we shall deal in Chapter 4.

Finally, the culmination of associationism was reached in the writings of Alexander Bain, during the last half of the nineteenth century. His system had three major features: first, he was a psychophysical parallelist, second, he attempted to relate his interpretations to physiology, notably, the brain, nervous system, and sense organs, third, he based his explanation of mental processes on the two main laws of contiguity and similarity (4, pp. 81f.).

Since Bain's time, associationism has persisted in one form or another, but as an aspect of behavior rather than as its sum and substance. Learning and remembering undoubtedly occur according to certain favorable and unfavorable conditions, as implied in the laws of association. Robinson (6) lists a dozen or more of these laws, which have been advocated at one time or another, it is probable that they express *conditions* of learning, recall, etc., rather than laws. Thinking, also, depends upon when and where and how the original learning took place, as will be repeatedly shown, so that, call them what we will, and base them upon scientific experiment as we do, the principles of association still have relevance to thinking.

PHYSIOLOGY

Another development of great significance preceding the establishment of psychology as an independent science was the steadily growing body of physiological knowledge, extending from 1800 to 1870. The conclusions derived from experiments conducted between those years are now taught in every class in elementary psychology, but they were very dramatic indeed at that time.

Thus, it is now a simple fact that the spinal nerves have separate motor and sensory branches, and that only one of these functions is mediated by a given nerve fiber. The Bell-Magendie law, independently stated by the two men during the second decade of the nineteenth century, expresses these facts. It also includes the fact that the nervous impulse is conducted along the fiber in one direction only (which follows of necessity from the law). This law has had enormous significance for all later research on the nervous system, since it is basic to an understanding of how that system is organized and how it functions in, for example, the reflex arc.

Bell's researches also led him to refine further the functions of the nerves, anticipating J. Müller, who formulated in 1838 10 laws dealing with the "specific energies of nerves." This doctrine, to the effect that different kinds of nerves mediate different and specific sensory functions, represented a great advance in the knowledge of how man is related to the external world (and, by the way, to his own inner environment).

An event of even greater significance for the psychology of thinking was the measurement of the velocity of the nervous impulse, carried out in 1850 by Helmholtz. This experiment took a great deal of the mystery out of man's nature. It had been supposed that the nerves transmitted impulses so rapidly that the speed could not be measured. Hence, reducing it to finite terms (the speed varies for different kinds of fibers, but it is really comparatively slow) contributed to the realization that all behavior can be studied and measured.

There were, of course, many more important discoveries during this time, such as electrical studies of localization in the brain, all of which form part of that fertile scientific background out of which psychology emerged. It should be noted, however, that this background led first to an interest in the special senses, extensive investigations of which constitute the first body of psychological knowledge founded on experiment. Thinking was harder to reduce to experimental terms and thus waited longer for scientific treatment.

GERMAN EXPERIMENTAL PSYCHOLOGY

Although most of the great German experimentalists of the last century were concerned with problems in areas other than thought processes, especially sensation and perception, these experimentalists had a twofold significance for the psychology of thinking. In the first place, it was through their efforts that psychology parted from both philosophy and physiology and developed its own methods and subject matter, in the second place, they were experimentalists, thus setting the stage in a

very impressive manner for the employment of scientific procedures and objective analysis to study human behavior. Most of the early pioneers in American psychology received their training at the German universities. We may mention several of the men who founded experimental psychology.

Fechner (1801-1887) attempted to relate in a systematic fashion the psychological and physical worlds, by establishing the relationship between stimulus and sensation. He developed the psychophysical methods, still widely used, for this purpose and gave specific formulation to Weber's law. He also founded experimental aesthetics, a field in which comparatively little has been accomplished even today.

Helmholtz, mentioned above, did much to advance the study of sensation and perception, working in the fields of vision and hearing.

Ebbinghaus (1850-1909) carried out classical studies in memorizing and forgetting, the conclusions from which are familiar to every psychologist.

Wundt (1832-1920) founded the first formal psychological laboratory at Leipzig, in 1879. His many students widely pioneered in psychology and founded laboratories of their own. In Wundt's laboratory were developed the strict introspective methods so important in the early studies of thinking. We shall deal further with Wundt's contribution in the next chapter.

Finally, the movement known as "act psychology" began under the leadership of Brentano (1838-1917). Whereas Wundt and his successors (especially Titchener) occupied themselves with the contents of consciousness, the act psychologists wanted to study activities rather than passive contents. The line of development leads from Brentano to Stumpf and Kulpe, to imageless thought. The experiments conducted by Kulpe's students will be considered in Chapter 4.

SCHOOLS OF PSYCHOLOGY

Modern psychology has been characterized by a number of dynamic movements which have exerted an extremely stimulating influence. Each in its own way has made contributions to the psychology of thinking, and we shall have occasion to draw heavily upon their research and theories. The structuralist school, under the leadership of E. B. Titchener, used introspective methods to analyze mental contents such as images and ideas. The behaviorists, led by J. B. Watson, urged the use of experimental observation rather than introspection in the study of thinking, as well as in other aspects of behavior, and suggested the idea of subvocal speech which is of great importance for the motor theory of thinking. The gestalt school developed the field theory to explain behavior, and

this school is only beginning to have its influence, its extensive studies of thinking we shall return to. Nor can William James be forgotten. Although he was only indirectly part of a psychological "school," his great textbook, in two volumes, which appeared in 1890, has had a profound influence on psychology. His theory of the "stream of thought" will be discussed in the next chapter. Finally, mention must be made of psychoanalysis, originating in the efforts of Freud to explain and treat neurosis but since then taken up to varying degrees by psychologists, as well as by workers in other fields. We shall call upon psychoanalysis frequently in the chapters to follow.

CLINICAL PSYCHOLOGY

The subject matter of this book is not directly related to clinical psychology, but more to experimental psychology. Nevertheless, clinicians have contributed much to the psychology of thinking, as, for example, in collecting and interpreting the results of intelligence, personality, and special tests of all sorts. Particularly when we discuss thinking processes revealed through the use of projective techniques shall we borrow from their conclusions.

ANTHROPOLOGY AND SOCIAL PSYCHOLOGY

Another line of development which has much significance for the psychology of thinking is that represented by movements in the social sciences. Both anthropology and social psychology, as sciences, grew up almost alongside of psychology. During the last twenty-five years of the nineteenth century, at the time the first psychological laboratories were being founded, anthropology began to free itself from anecdote and arm-chair theorizing to go out into the field. L. Morgan's *Ancient Society* was published in 1877, and Tylor's *Anthropology* appeared in 1881. In America the "father" of scientific anthropology was Franz Boas, whose influence became marked after 1900. Since then, anthropologists have had an increasing amount to say about man's nature and ways. For us, the single most important contribution of anthropology is the realization that men do not think alike everywhere, but that culture determines not only their clothes, diet, and laws, but also what and how they think.

Social psychology really dates its modern development from William McDougall's *Introduction to Social Psychology*, published in 1908. Of course, sociology has had its strong influence on the evolution of social psychology and continues to shape it in conjunction with psychology. Social psychology contributes much regarding the socialization of the individual and his relation to the institutions which mold his thinking.

COMPARATIVE PSYCHOLOGY

Finally, we may mention comparative psychology, which, today, usually means "animal psychology." It, too, freeing itself at the end of the last century from anecdote, has evolved along lines of strict, controlled experimentation and precise theorizing. Of especial importance in the study of thinking are numerous experiments relevant to problem solving. Some of them will be discussed in Chapter 9.

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Chapter 3. CONSCIOUSNESS AND THE FIELD OF ATTENTION

The problem of how mental processes are organized has always occupied psychologists. It has to do, for example, with the apparent fact that at different times the individual is in contact with the external world to different degrees. Thus after a severe blow on the head the individual may "pass out," may become what we call "unconscious", other extreme variations of "consciousness" are the state of anesthesia, of sleep, of hypnosis, of delirium, etc.¹ Even without mentioning such marked and obvious changes in consciousness, however, one may note great fluctuations in the relation between mental processes and the environment. For instance, a person may be engrossed in a book and fail to hear a knock on the door, or listen to someone deliver a lecture without really hearing what is said. And perhaps everyone has had the experience of passing a certain house every day for weeks and then suddenly, for no apparent reason, "seeing" it for the first time, or, after having listened repeatedly to a Beethoven symphony, of noticing for the first time a particular little oboe passage.

What does it mean to be conscious, and how can one account for these phenomena? These questions are important for the psychology of thinking. Although we cannot answer them, as yet, with complete satisfaction, we can make an approach in that direction.

The words "conscious" and "consciousness" are not in good repute in modern psychology, there is too much ambiguity attached to them. Hence, as in the case of "instinct" and other terms, psychologists have frequently attempted either to abolish the words from their technical vocabulary or to substitute other words for them. Granting that this avoidance of the issue is not satisfactory, both because it does not solve the problem and because the popular vocabulary retains these terms in widespread use, we shall nevertheless be forced to follow somewhat the same procedure. We, too, shall avoid the use of the words 'consciousness' and 'conscious,' because of their numerous, ill-defined meanings.

¹ Cf. Miller (17) for a thorough consideration of various states and concepts of unconsciousness.

(17), except in the historical sections which introduce the present chapter. Actually, the phenomena discussed by James, Wundt, Galton, and the others are dealt with by psychologists, even if the vocabulary is usually quite different.²

TWO IMPORTANT ASPECTS OF THE PROBLEM

Broadly speaking, the effort to explain consciousness has two aspects. In the first place, it has to do with the relationship between the individual and his environment. The environment, in turn, has three constantly changing relations to the individual—the present, the past, and the future. Although the present is but a momentary condition developing from the future and immediately becoming the past, in actual practice the present is, psychologically, more stable than this statement would imply. We shall return to this point a little later.

The relation to the present is represented by perception, that to the past by memory, and that to the future by purpose. Thus the environment influences the individual in the present by way of the sense organs. The external environment affects the individual by bringing about a change in one of the "exteroceptors," the sense organs of sight, hearing, taste, smell, touch, temperature, pain, which in turn initiates a nervous impulse that is carried into the central nervous system. There, depending upon many factors (associated with the characteristics of the impulse itself and with the organization of the existing, or "going," nervous activities), the impulse leads to a response on the part of the organism. The internal environment of the individual—his biochemical state and the activities of his internal organs—affects the individual by way of the "interoceptors," the sensory mechanisms distributed throughout the body. Other relations to the present environment, such as a change in position in space, or movement through space, or the movement of parts of the body, are mediated by the "proprioceptors," the sensory mechanisms located in the muscles, tendons, and joints and in the vestibular and static organs of the inner ear. Thus a very large part of the problem of consciousness has to do with perception.

But the organism is also related to its past environment, which indirectly has a perpetual and continuous effect on behavior. Hence, another large area of the problem relates to how this past experience is represented in the organism and what its effects are. Here we see the role of learning and remembering in consciousness.

The organism has still another important relation to environmental fac-

² And note that the psychoanalytical use of the term unconscious (and "conscious") has effectively prevented psychology from eliminating the words from its technical vocabulary.

tors—those which have not yet actually been perceived. This relation may be called “purpose.” It enters into the problem of consciousness by means of a symbolic function. That is to say, the individual can set up a goal (or some other future condition, *e.g.*, a danger), attainable only days or weeks later, and direct his activities toward that goal. The symbol may be a word, for example, “formal dance,” which then serves as a substitute for the environmental facts not yet present. Or it may be an image of some sort. By this process the individual brings the future into the present and is, accordingly, influenced by it, regardless of whether or not the future event or conditions, when they become the present, are the same as they were anticipated.

To a considerable degree, then, the problems of consciousness are problems of adjustment to the environment. If the nature and function of the receptors, connectors, and effectors are explained, consciousness will also have been in large part explained. As we shall repeatedly see, however, it is also necessary to explain *in terms of what* the receptor-connector-effector system operates. That is to say, the system operates not in a vacuum but in a context both internal (implied by “connector”) and external. The latter refers to the society, the people, the variations in physical features of the environment, which stimulate the receptors.

A second aspect of consciousness, the one with which we shall mostly be concerned in the sections to follow, has to do with the organization of consciousness, with the problem of *what* is in consciousness and of how it functions. In this connection, psychologists have attempted to describe the composition of consciousness, different degrees of clearness of consciousness, and the manner in which consciousness changes over time. This problem is certainly fascinating and puzzling, especially since, perforce, it closely concerns the individual person, who can examine his own “consciousness” in these terms.

We shall briefly consider several historical treatments of the problem, and then develop a theory of “the field of attention.”

THE STREAM OF THOUGHT

William James’s description of consciousness is one of the great classics in psychology (11, Chap. IX). It is to this day a valuable exposition of the outstanding characteristics of thought, and many of its features have been elaborated in different terms by later writers.

He begins with an apparently innocent statement, which nevertheless has vital significance. “The first fact for us . . . , as psychologists,” he says, “is that thinking of some sort goes on” (11, p. 224). This statement might still, today, be taken as the credo of the psychologist. Regardless of the fact that many mysteries remain, that much which cannot be ob-

served must be inferred, we must accept the limitations of our understanding and proceed from that point. Although we shall not be able to explain just *what* thought is, or satisfactorily *how* it can occur at all, we can accept the fact that thinking "goes on," and attempt at least to describe its characteristics, in so far as we can.

James also states as a general law that "no mental modification ever occurs which is not accompanied or followed by a bodily change" (11, p. 5). This principle remains valid to this day. In fact, it is basic to the present work. It has two important implications. In the first place, it emphasizes the fact that "mind" must be approached through its counterpart the brain, with which it is, at the very least, inextricably bound up. Mental processes are simply one kind of behavior, although perhaps describable in special terms. Indeed, we may go further than James and say that it is extremely likely that mental processes have their basis and mechanism in actual, though invisible, bodily responses. This hypothesis, together with experimental evidence bearing upon it, will be examined in Chapter 5. In the second place, this law implies that more than the brain is involved in thinking. Even if the direct and primary locus of thought is the brain, nevertheless activities in other parts of the body, such as the viscera, the sense organs, and the muscles, influence the course of thinking. In short, it is probably true, as we shall repeatedly see, that we think with our whole body.

Next let us consider the famous formulation of the "stream of thought." James ascribed five characteristics to thought, as follows:

- 1 Every thought tends to be part of a personal consciousness
 - 2 Within each personal consciousness thought is always changing
 - 3 Within each personal consciousness thought is sensibly continuous
 - 4 It always appears to deal with objects independent of itself
 - 5 It is interested in some parts of these objects to the exclusion of others
- . . . —chooses from among them . . . —all the while

In these five points, James has expressed some undoubtedly important facts, although, in these days, we should prefer not to speak of thought as an entity in itself, as may be suggested by this formulation (even if we justifiably suppose that James himself did not intend that such an interpretation be drawn). We may also criticize the purely subjective nature of the formulation. Yet there remains a shrewd observation, here, which anticipates much of the later work, experimental and otherwise.

A few comments may be made about this theory. First, note that James emphasizes the personal side of thought. Every thought appears to be *owned*; strictly speaking, no thought is impersonal or existent by itself but comes from, or occurs in, some person's mind. It is a little hard to

see how this characteristic can cover all the facts, for instance, certain pathological phenomena such as in multiple personality and hallucination where the individual may not recognize his "self" at all. Yet even here one has some self ("secondary self," as James puts it) which, having thoughts, owns them. In this sense, dissociated thinking also fits the principle. Beyond that, however, one may regard the rule as a potentiality rather than always in actuality. That is to say, at least in normal persons a thought which lacks this personal reference *may* be (and will be) recognized as belonging to the thinker, in the long run. Thus when a person awakens from a dream or reverie, the thoughts which have just occurred are usually readily recognized as personal.² Aside from this factor of personal reference, James was basically concerned with the point which still needs occasionally to be made, that thinking occurs in human minds and that, in consequence, thoughts do not occur or exist outside them.

The second point states that thought continually changes. "No state," James says, "can recur and be identical with what it was before." The brain, in other words, is constantly being modified by the nervous impulses which enter it, and this cumulative record has an influence on what follows. James here expresses some of what we mean by the "mental context." He also anticipates many important psychological theories which have been elaborately stated in highly technical terms. Thus a basic tenet of psychoanalysis is that the individual's past history has a profound effect on his present mental processes, and the gestalt field theory similarly suggests that the present thought occurs in terms of, and as determined by, the entire succession of past mental processes as they have modified the individual. Both these theories could take as their motto James's statement: "Every brain state is partly determined by the nature of this entire past succession."

The third principle, having to do with continuity, is the statement of thought as a "stream." It rests upon two points, namely, (1) that successive mental processes seem to belong together even if there is a time gap between them, and (2) that shifts from one moment to the next are never absolutely abrupt. Again, this formulation may not fit pathological cases such as amnesia, but it does characterize the normal person (and conversely, expresses the nature of those abnormal cases where these features are disturbed). For example, after a night's sleep one has no trouble in recognizing that his present mental processes are his own, i.e. the gap of the night's sleep is readily filled in.

In developing his third point James describes the organization of con-

² Note too that the object of therapy is to restore this personal reference so that for instance the hallucination is recognized as originating in the person himself.

consciousness, for thought appears to consist of resting places ("substantive parts") and places of flight ("transitive states") Thought, in its continuous flow, appears to move more swiftly and with less definiteness between the resting places Accompanying the main flow of thought are "feelings of tendency," "unnamed states," by which James seems to mean a kind of integration among mental processes These qualities have to do with the fact that thoughts are tied together, as in speech, where words are not strung together at random but a connected series of ideas is expressed, each idea growing into the next and related to the ones before This whole notion bears similarities to the "determining tendency," a vitally important concept in psychology, with an interesting modern development in the study of attitudes The next chapter will pursue this matter further

Finally, in discussing the continuity of thought, James discusses the "fringe" of consciousness, or the "psychic overtone" Here, again, he points out that the stream of thought flows in a context It appears to be organized so that it fades off from a central focus into vaguer, less conscious, accompanying states, which nevertheless influence the course of thought This conception is related to Wundt's theory of apperception (see below).

As for the fourth and fifth principles, the former emphasizes that thought tends to deal with objects, rather than with the thought itself That is, we do not think about thoughts, but of objects, or ideas, for which the thought is simply a representation⁴ The fifth principle points out that there is a selective process continuously operative in thinking in such a way that some of the innumerable possibilities are accepted and some rejected We shall have much more to say about this point

THE 'ANTECHAMBER OF CONSCIOUSNESS'

Francis Galton, another figure prominent in the history of modern psychology, presented another conception of the organization of thought (9) Although his theory has not had an influence comparable to that of James, it is worth mentioning as an interesting early effort to deal systematically with important aspects of thinking

A little fancifully, he spoke about a "presence chamber [in the mind] where full consciousness holds court and where two or three ideas are at the same time in audience," and an "antechamber full of more or less allied ideas, which is situated just beyond the full ken of consciousness" (9, 146) In other words, he conceived of the mind as consisting of a

⁴ y be extended in modern terms to mean that thoughts seem to be something in the mental process itself, i.e., it is not possible to be aware of a of what the neural event stands for

central, clear, active body of ideas, selected from among numerous other ideas. The selection of the contents of the "presence chamber" is from the "thronging" antechamber carried out by the "logical faculty," an interpretation which is indeed vague and insufficient to modern psychologists.

Thought depends upon three factors: (1) "Large attendance in the antechamber," (2) presence in the antechamber of "no ideas except such as are strictly germane to the topic under consideration," and (3) "justness of the logical mechanism that issues the summons." Each of these factors raises far more questions than it answers. For instance, one wonders where the ideas in the antechamber come from, one may inquire whether some prelogical faculty (or what) excludes from the antechamber ideas not germane to the topic, and one asks how the "justness" of the logical mechanism comes about, or just what "justness" signifies.

It is probable that Galton's notion was developed through his personal introspections. The purely logical nature of his description is obvious, indeed, he is probably speaking only about logical thinking, a mistake frequently made to this day in the study of thinking. However, to identify thinking only with logical reasoning is extremely misleading, since a vast amount of thinking is not logical at all. Moreover, even skilled reasoning involves nonlogical processes.

Be that as it may, Galton's conception has some features similar to James's, notably with respect to the antechamber, which is related to the fringe of consciousness, and the fact that a selective process operates to determine the content of consciousness.

It may be noted, too, that the notion of the antechamber is not far from the preconscious of Freud.

APPERCEPTION AND ATTENTION

Wilhelm Wundt was a fabulously productive writer on psychological (and other) subjects. Today he is chiefly known because the founding of psychology is dated from 1879, the year in which he established the Leipzig laboratory. His tridimensional theory of feeling still finds a place in an occasional textbook—a theory which it is essential to know in order to read his works, because of the careful manner in which it is integrated into his interpretations of psychological phenomena. His doctrine of apperception, which we shall briefly discuss, aroused a great deal of interest and controversy, it still has a curious interest for the psychologist who meditates about his subject matter, if he has not been too much influenced by behaviorism.

In general, Wundt defines consciousness as the interconnection of psychical processes (27, p. 228). Hence, the combination, or synthesis,

of mental processes and their interrelations are the identifying feature of consciousness. Unconscious states are those in which this interconnection is interrupted.⁵ The interconnection between mental processes may be either simultaneous or successive. In the latter case, Wundt's interpretation is similar to that of James, *i.e.*, that the time gap is bridged through relating the present to the events which occurred earlier.

The organization of consciousness is such that degrees of clearness exist. There is a central focus, or "inner fixation point," of maximum clarity, surrounded by a dimmer area. The entire content of consciousness at any moment Wundt calls the "field of consciousness." A continual train of "psychical compounds" moves into and out of this field. In the former case it is said to rise above the threshold of consciousness, in the latter to sink below the threshold (thus becoming unconscious). Attention is the "state which accompanies the clear grasp of any psychical content," and apperception is the "process through which any content is brought to clear comprehension." Still other contents may simply be apprehended, that is, perceived without an accompanying state of attention.

Functionally, a "psychical compound" in the train of events goes through a cycle. It rises above the threshold of consciousness, thus entering the field of consciousness, and moves towards the "inner fixation point." If it reaches the fixation point, and hence is clear, distinct, and dominant, it is said to be "apperceived." If not, then it is merely "apprehended." In either case, the process returns to the periphery of the field and disappears. Now conceive of a perpetual horde of "psychical processes" entering and leaving the field of consciousness, and you have Wundt's idea of the mind. Each of these states has its characteristic accompanying feelings, formulated in keeping with Wundt's tridimensional theory.

Apperception, therefore, is the process of clear comprehension, occurring at an inner fixation point. There are two sorts of apperception, according to Wundt, namely, (1) "spontaneous or passive apperception," a situation in which some 'new content may force itself on the attention suddenly and without preparatory affective influences" (27, p. 244),

⁵Wundt also uses the term unconscious in a somewhat different sense to refer to mental elements which have disappeared from consciousness (this fading out continually occurs). Such elements have a possibility of renewal but our knowledge about an element which has become unconscious does not extend beyond this possibility of its renewal. For psychology, therefore, it has no meaning except as a *disposition* for the rise of future components of psychical processes which components are connected with earlier conscious processes (27, pp. 232-233). Contrast this view with that of the psychoanalysts.

and (2) "predetermined or active apperception," where some "new content may be preceded by the preparatory affective influences . . . , and as a result the attention may be concentrated upon this content even before it arrives" (27, p 245) Both of these situations have their characteristic accompanying feelings

Boring has summarized Wundt's theory of apperception by pointing out its three main features (4, pp 333ff) As phenomenon, apperception deals with the introspectively apparent fact that there are two degrees of consciousness, a kind of central focus, and a surrounding, or concomitant, wider field of lesser clearness The former is what Wundt means by apperception As cognition, apperception is a relational process whereby logical connections are formed between mental processes As activity, apperception is a "constant current in the stream of consciousness," that is, it functions in the organization of consciousness in the manner described above.

Psychologists today seldom, if ever, use the term "apperception" It is too confusing and attempts to explain too much It deals with some essential facts, to be sure, but the introduction of a special term is not necessary to account for them Titchener, one of the most prominent pupils of Wundt in America, and surely the most stubborn, himself refused to accept the term (24, p 367) His theory of attention, however, is in close agreement with Wundt

He defined consciousness as the "sum total of mental processes occurring *now*, at any given 'present' time" (24, p 19) Consciousness is the same as mind, except that the former is a cross section of it, such as occurs at a specified moment in time, whereas the latter is the "sum total of human experience" for a given person

Within consciousness, Titchener, like Wundt, describes two levels, an upper level marked by clear and strong focus and a lower level which is obscure and marginal He uses the term "attention" to cover the phenomena which Wundt calls "apperception" * Thus, he describes two kinds of attention, "passive or involuntary" and "active or voluntary" (cf Wundt's types of apperception)

In a functional sense, attention goes through developmental phases In the first instance, attention is of the passive sort (primary), that is, determined by whatever stimuli are strong enough to have an effect on the nervous system The next stage is 'secondary attention,' when some perception or idea is in the forefront of consciousness and kept there, but in the face of opposition of other ideas or perceptions seeking to get into the

* The reason apparently, that Titchener sees no point in adding the word "apperception"

center of consciousness. Finally, there is a third phase, "derived primary" attention, when a perception or idea has become dominant over competing processes. This latter condition is what we would call "concentration." Titchener conceives of it as a sort of relapse into primary attention, since again only a powerful stimulus can have an effect. Some of the determinants of attention (especially relevant to primary attention) are the intensity, quality, suddenness, and novelty of the stimulus, movement, repetition of a stimulus, and congruity of the intruding stimulus with the present contents of consciousness.⁷

BORING'S CONCEPTION OF CONSCIOUSNESS

A student of Titchener, E. G. Boring, has attempted to formulate what he calls a "relational" psychology (5). For him, consciousness and attention are one and the same. Both involve the relation between stimulus and response, and the selection which is inherent in the resulting organization. Selection is a central process and "mostly of the brain", thus consciousness, or attention, is localized in the brain. Hence the study of consciousness becomes largely a problem of the psychology of perception, which attempts to establish relations between stimulus and response. The reason that consciousness seems to be different from the accompanying physiological (neural) event is that knowledge of the neural event is lacking. However, the closer one can correlate the conscious event with the neural event, the more identical the two become. In these terms, they are ultimately the same. The chief criticism of such an explanation is that a perfect correlation does not in reality *prove* identity. All it shows is that two phenomena are invariably related to each other, but the two phenomena do not necessarily become one. On the other hand, Boring may merely use the notion of correlation in a symbolic sense, in reality intending to say that, as apparent differences between conscious and neural events are successively resolved, we shall ultimately find that there are no differences.

Boring recognizes the distinction noted in the foregoing sections between two levels of consciousness, but he doubts the value of stressing the distinction between them. It may, instead, be a matter of what the subject reports upon, for, by directing attention to the so-called "marginal processes," they become focal.

Consciousness, then, according to this view, comes down to relations or discrimination. It must be defined by the characteristics of perception and is delimited by those characteristics, or "dimensions." These dimensions are those familiar to psychologists (both by reference to the stimulus and the

⁷ See Woodworth (26, Chap. XXVII), for a general survey. The conditions of attention are discussed in Pillsbury (19, Chap. III) and brought up to date by Tiffin, Knight, and Asher (23, pp. 319-326).

neural event which follows and by the apparent psychological event or perception), namely, intensity, extensity, protensity (duration), and quality (modality).

A BEHAVIORISTIC VIEW OF CONSCIOUSNESS

Lashley has made a forthright statement of the behaviorist's position on the question of consciousness (14). He goes much further than Boring does in saying that consciousness is not something to be described in introspective terms. It is behavior and nothing else and can be reduced to the "physicochemistry of bodily activity. . . . The statement 'I am conscious' does not mean anything more than the statement that 'such and such physiological processes are going on within me'."

His argument is too lengthy to be repeated here. He considers, one by one, the various characteristics ascribed to consciousness and lucidly points out how each can be fully understood strictly in physiological terms. He then links consciousness to the language mechanisms, a position which may be interpreted to signify that the so-called "phenomena of consciousness" are simply the verbalized (and verbalizable) outcome of neural activities. Hence, in a way, verbal responses have been mistaken for the facts of consciousness, since they are readily expressed in that manner.⁸

THE FIELD APPROACH

Nowhere in modern psychology is there so profound a realization of the complexity of psychological processes as in gestalt psychology. Perhaps it holds more implications, as yet very poorly understood, for the future than any of the historical movements.⁹ The reason this complexity emerges so strongly in the gestaltists' approach is that they have dealt with organization and dynamic interrelations within that organization, rather than content themselves with events, or processes, considered separately. Until the present day, the gestaltists' approach has been applied principally to problems of perception and memory. The inevitable extension of their principles to other aspects of psychology, as has been done by Murphy, is certain to lead to much greater understanding of behavior.

We shall not attempt here to review gestalt psychology in detail or to trace the development of its principles.¹⁰ There are, however, certain of these principles which need to be stated in the present connection.

⁸ Although we have not discussed it here, Lashley's notion of a "conscious machine" is conceptually extremely important. The reader is referred to his article for this aspect of his argument.

⁹ G. Murphy has made a considerable contribution to the realization of these implications in *Personality* (18).

¹⁰ Such an exposition is available in Koffka (12) and Kohler (13).

Isomorphism is one of these. It is a modern solution to the mind-body problem (see 12, pp 56ff) It states that there is an identity of form (hence, "isomorphism") between psychological, or conscious, processes and their underlying physiological processes, so that "characteristic aspects of the physiological processes are also characteristic aspects of the corresponding conscious processes" (12, p 109) (The principle can be stated in a reverse manner also) In other words, isomorphism considers that there is a fundamental and invariable relationship between physiological and conscious aspects of behavior, but how the latter property comes about cannot now be stated, if it ever can (12, p 65) (Note how this differs from Lashley's view) In any event, the principle implies that, despite the fact that physiological and conscious processes have the same structure, the two are equally important, and both must be studied. The conscious aspects can be treated as such, since the physiological events are known only through their conscious correlates.¹¹

In short, psychology seeks to understand and explain the conscious aspect of experience, while inferring that the physiological aspect has an identical form. It would relate the two by proving, in instance after instance, that they *do* have the same form.

A second principle is that conscious experience is organized, not in terms of separate parts having little to do with each other, but as a totality. That is, all the aspects of behavior have a dynamic interrelationship, and, even beyond that, the total organization includes not only the organism but the environment to which behavior is related. This principle makes for difficult and complex analysis. That is why Koffka appears to be discussing several different organizations e.g., behavioral, geographical, etc. (Words are incapable of expressing simultaneously all the factors which make up the organization, but Koffka would like to have them do so) The implication of this principle for us, if we apply it to thinking, is that mental processes are but one aspect of the total behavior of the organism and are at all times related to all the other aspects of behavior. Thinking is not independent, ever, of emotional, or motivational, or perceptual, or any other kind of behavior.

To explain systematically the nature and functioning of this complex organization, the gestalt psychologists have introduced a field concept. That is to say, behavior may be understood in terms of forces, of "stresses and strains" in continual interplay, so that behavior is the outcome of whatever momentary system of forces exists. Dynamic relations within the total field exist not only between psychological processes in the organism but between the organism and the environment (the latter, too, has its

¹¹ Gestalt psychology does not wish to renounce consciousness or to regard it as an epiphenomenon. Contrast again with Lashley.

field properties which help to determine the total organization) In this sense, attention is conceived to be an actual force between the organism and an object¹²

PSYCHOANALYTIC CONTRIBUTIONS

One of the most important sources of theory pertaining to consciousness originated in the psychoanalytic school, founded by Sigmund Freud (see Healy, Bronner, and Bowers, 10, and Fenichel, 8, for detailed expositions) For the present purposes, four aspects of psychoanalysis may be singled out for particular mention

The first point concerns the emphasis of psychoanalytic investigators upon mental dynamics They stress the fact that mental processes are the outcome of forces which interplay in the determination of the mental life of the individual In order to understand thinking it is necessary to seek out the underlying energies of which mental processes are the expression An important principle which emerges from this search is that no mental activity is purely aimless or accidental, if it appears to be aimless, it is because the reason for it is somehow concealed

The second point can readily be deduced from the first, namely, that thinking can be understood only by tracing the development of the individual¹³ His present mental activity depends upon his previous experience and has a continuous, if often indirect or distorted, relationship to it Thus a major part of the task which psychoanalysis sets itself is tracing out the mental and emotional history of the individual When this procedure is followed, vast areas of cognitive functioning, otherwise inaccessible or incomprehensible, are revealed We shall principally be concerned with this genetic problem in Chapter 13

The third point emerges from psychoanalytical attempts to trace individual development, and in many ways it is the most distinctive contribution of psychoanalysis It concerns the existence of unconscious processes in mental life Evidence comes from many sources, including hypnosis, dreams unexpected appearance in awareness of forgotten acts or experiences, and free association In all these cases, explanations for meaningless or strange phenomena can be found by uncovering the connections between conscious behavior and inner mental processes of which the individual is not ordinarily aware Evidence in this direction strongly points

¹² Koffka describes the kinds of attention met with before Voluntary attention starts from the ego (itself a part of the field) toward an object Involuntary attention starts primarily from the object

¹³ Some psychologists might criticize the parts of psychoanalytic theory which deal with development because they are derived in large part by working backward *ie*, by reconstructing the past history of a person

to the existence of a great reservoir of mental activity which lies outside the familiar course of thinking but which nevertheless influences it, and which links present behavior with previous experience

Finally, the fourth point deals with the notion that mental processes are organized. Here Freud conceived of strata, or levels, generally called the "conscious," the "preconscious," and the "unconscious." Conscious activities are those of which the individual is aware, unconscious activities, those of which the individual is not or cannot be aware, and preconscious activities, those which are transitional, so to speak, or capable of appearance at some time or other in the individual's awareness. As we shall see subsequently, unconscious aspects of thinking are of several kinds, of which the most significant in psychoanalytic theory are those under strong tension but not permitted to attain conscious expression. They are held in check because they are unacceptable or harmful in some way to the conscious behavior of the individual. Conscious and unconscious processes do not run independent, separate courses, rather, there is an interplay between them in several ways: (1) Impulses originally unconscious may penetrate into consciousness, if they are deprived of dangerous emotion, or if they are distorted into acceptable form.¹⁴ (2) Unconscious activities are assumed to bombard the barriers to their direct outlet and to exert modifying influence upon conscious processes. (3) Unconscious ideas may be gradually brought into consciousness, by converting them first into the transitional forms which characterize the preconscious and thereafter admitting them into consciousness.

In addition to these distinctions, however, organization is conceived in another way. The mind is said to have a structure composed of id, ego, and superego. The id consists of unconscious mental processes associated with the fundamental (instinctual) energies of the organism, which are constantly striving for expression. In seeking outlet, impulses from the id meet with the world of external reality, which imposes its restrictions upon the individual. To cope with these demands, the ego gradually becomes established. It represents, therefore, that part of mental life which is molded by and subject to the demands of external reality. It becomes "the mediator between the organism and the outer world" (8, p. 16). Part of the ego thus is the comparatively narrow range of conscious activities, but it also has deep connections with unconscious activities. The function of the ego is to organize the behavior of the individual in an acceptable manner, that is, to achieve the satisfaction of needs with a minimum of risk. Generally speaking, when one talks about "socialization" and the development of concepts and attitudes, he refers to the formation of the ego, and psychological functions such as perception, problem solv-

¹⁴ Cf. Chap. 14 where the dynamisms of distortion are discussed.

ing, and goal behavior correspond to ego activities. Finally, psychoanalysis conceives of a third kind of agent in mental life, the superego, which is a special derivative of the ego. It represents criticizing and inhibiting functions, retained from the early stages of development during which the child incorporates within his mental structure the prohibitions and directions of the parents. Superego activities are largely unconscious and maintain close relationships with the impulses of the id. They correspond to the phenomena of conscience and guilt of everyday life. The superego is regarded as the crucial determinant of what unconscious processes can be permitted to become conscious, and it exerts over the ego a kind of irrational supervision stemming from the protective and directive influence of the parents.

All four of these basic tenets of psychoanalytic theory have had profound effects on the psychology of thinking, so much so that they have become inextricably bound up with it. Today, the dynamics of mental processes have become a primary interest of psychologists, the significance of past experience is fully recognized, the existence of unconscious determinants is an axiom, and the efforts to formulate mental organization is a foremost problem, even if the Freudian models are not everywhere accepted.

SUMMARY OF PRINCIPLES

With the psychoanalytic approach, we conclude our all-too-brief review of some historical antecedents to a modern view of consciousness. We have presented these theories not to survey completely psychological thinking on this matter but rather to show that the viewpoint now to be presented is not original by any means. But before formulating a frame of reference for this book, it will prove useful to state the main points suggested by the foregoing theories. These are as follows:

1. Consciousness is not something distinct from bodily (physiological, neural) processes but merely appears to consist of different phenomena. The seeming difference can be accounted for, perhaps, by the fact that the neural event is not observable, at least introspectively, and cannot be reported, as such.
2. Consciousness displays an organization of some kind. That is, it varies in degree of clearness, or of amount of activity, or of effect upon behavior. This organization has been described as composed of two or three "levels," or "areas"—a somehow central, clear part, a peripheral, more indefinite part, and a part outside of awareness. These parts are defined by properties of the organism. Two additional points follow from this conclusion.

- a* Selective mechanisms operate to determine what is to be included at a given moment within the conscious organization
 - b* The organization (and content) of consciousness continually changes, depending upon the various factors which influence it
- 3 Consciousness is conditioned by the individual's relation to the external world (in fact, it is that relation, more than anything else), hence it is linked closely to perception and the characteristics thereof. It may be mentioned here that this relation needs to be extended in the opposite direction, for consciousness is also conditioned by the individual's relation to his internal environment (cf Angyal, 1, Rossett, 20, and Schilder, 21)
- 4 Consciousness has continuity, that is, other things being equal, present mental events are connected with past events (and, as previously noted, by the anticipation of future events)

THE FIELD OF ATTENTION

It is now possible to outline an acceptable conception of the way mental processes are organized in relation to the current, momentary behavior of the organism. Thinking occurs in the framework defined by this organization and is determined by the same kinds of factors.

We shall use the expression "field of attention" to refer to all those stimuli (external and internal) of which the individual can potentially be aware at a given moment. This field is limited in certain general ways. In the first place it is obviously limited by the sensory capacities of the organism (here, and henceforth, the human being). One such capacity is the sensitivity of the sense organs itself variable, as is true of all the factors to be enumerated. Thus there is a range of sound vibrations which will yield an auditory response, others, outside that range, will not, and similarly for all other sensory mechanisms. Another such capacity is the specificity of the sense organs. For example, the human being has no known means for perceiving cosmic rays or X rays.

In the second place, if defined in physical terms, the field of attention is broadly limited by the characteristics of the external stimulus. That is, an effect can be produced on the organism only if the stimulus is strong enough or has some other characteristic which will make it noticeable. Clearly this factor is equivalent to the one above, viewed differently.

In the third place, the field of attention is limited by the availability of stimuli, *i e*, by the existing environmental conditions apart from definition of stimulus and sensory properties. A gunshot on the island of Oahu cannot be heard by someone on the island of Guam. In other words, only those stimuli within range of the organism can have an effect on the field of attention. This point is made to emphasize that the individual behaves

within a context, it is not enough to specify stimulus and sensory variables without bringing them into proper relation

In the fourth place, the field of attention is limited by the past experience of the individual. That is, if a person has never seen an apapane¹⁵ or a picture of an apapane and has never heard anyone describe an apapane, he cannot have any conception of an apapane which corresponds to the facts about apapanes. Thus that part of the field of attention which consists of, or is affected by, past experience will depend upon what that experience was.

To summarize thus far, the field of attention is determined by the sensory capacities of the organism, by the characteristics of the stimulus, by the current environmental conditions, and by the past experience of the individual. As a first definition, then, we may diagram the field, as shown in Figure 1.

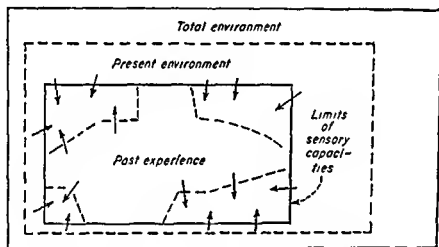


FIG 1 A diagram of the field of attention

Next let us consider the fact that the potentialities suggested by the figure are not fully realized at any moment. The actual organization shifts and changes from moment to moment (3). That is, there are various degrees of awareness by the organism, and there are selective mechanisms responsible for variations in awareness. The first of these two problems concerns the organization, the second, the functioning, of the field of attention.

As far as organization is concerned, we may think of three divisions of the field of attention: (1) awareness, (2) transition to awareness, and (3) lack of awareness (unconsciousness). Awareness may be defined as a condition in which "the subject knows the stimulus, the response, and the relation between them (*i.e.*, that the response results from, or is determined by, the particular stimulus presented)" (25). Lack of awareness

¹⁵ A species of native Hawaiian bird pronounced "ah pah pah nay."

is a condition under which none of these aspects is known (either because it is not possible to know them, as when the stimulus is outside the sensory capacity of the organism, or because there is some barrier to awareness, as in the case of repression) Between these two conditions there extends an "area of transition" in which the organism may sometimes be aware of the stimulus and/or the response and/or the relation between them The line of demarcation between these divisions is called the "threshold" But it is plain that the threshold is extremely variable, on both sides of the area of transition, hence the necessity of defining the term "threshold" more carefully¹⁴

As a statistical concept, the threshold is an average point, defined in terms of the stimulus condition which evokes a specified response a specified number of times Thus an investigator might decide that a light of a certain intensity reported as visible 75 per cent of the time is of thresh-

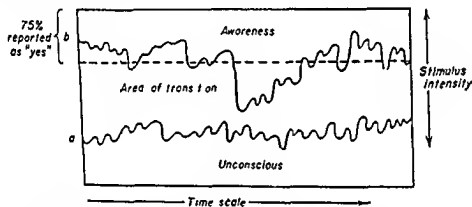


Fig 2 Organizational relations in the field of attention (modified from Vinacke, 25)

old intensity A light of weaker intensity is subthreshold, one of stronger intensity is above the threshold However, two conditions may modify the momentary threshold one is the physiological state of the mechanisms involved (in the sense organ or the nerve fiber), and the other is the psychological state of the organism, e g, what he knows about the environmental conditions (15, 16) Roughly, the physiological state affects the lower margin of the area of transition, the psychological state the upper margin These facts may be clarified by another diagram (Figure 2), which represents a fragment of experience over a brief period of time At a given moment, the individual may be aware of a given stimulus and at another moment not aware of a stimulus of the same intensity as the first, provided the stimulus intensity falls within the area of transition If it falls below a minimum intensity, however, represented by the lowest point of line *a*, the individual can never be aware of it, if it falls above

¹⁴ An interesting illustration of the threshold concept as employed here may be found in Douglas (7)

line *b*, at its highest point, the individual will, save in exceptional circumstances, always be aware of it.

The foregoing has defined the field of attention with reference to the conditions of physical stimuli, that is, in terms of the relation of the individual to the external world. The conditions shown in Figure 2 must be multiplied many times—in keeping with the various avenues whereby external stimuli make themselves known. In a sense, the individual is a complex system of awareness, thresholds, and areas of transition, each with its varying conditions and altogether comprising a multidimensional field of attention. "Unconscious" here refers solely to those aspects of the environment which *cannot* be perceived by the individual. Those which *can* be perceived but *are not* are said to be within the area of transition and hence below the psychological threshold, but not below the physiological threshold.

Our picture would, however, be incomplete without defining the other side of the field of attention, that determined by the internal environment or needs of the individual. The principles set forth above apply here, also. Awareness occurs when the inner state fulfills the conditions of crossing the threshold (intensity is not the only condition, for the psychological threshold may itself be modified, but only within the limit set by the physiological threshold).

Two meanings of unconscious in relation to inner conditions must be distinguished. The first meaning is similar to that employed with respect to the stimulus. That is, an inner need may be very weak, or below the momentary physiological threshold. For example, in recurring cycles such as in hunger, the need builds up to some threshold intensity before the individual becomes aware of it. Furthermore, there are vast stores of past experience which, though represented in the tissues and part of the mental context, are very weak in strength and hence unconscious.

The second meaning is essentially the same as that of the psychoanalytic unconscious¹⁷ (10, pp. 24ff.). That is, inner states may be strong, but they are under restraint and thus repressed, or prevented from entering the field of attention. Needs which are unconscious, in this latter sense, although prevented from crossing the psychological threshold, nevertheless have a powerful effect on the field of attention, in various indirect ways, e.g., through the selective mechanisms which modify the psychological threshold in various directions.

So far, we have merely defined the field of attention and indicated

¹⁷ There is no reason that these meanings should be mutually exclusive. Perhaps the psychoanalytic meaning corresponds to the area of transition. The fact that inner states are held in check, however, rather than weak, makes it impossible to sustain the correspondence strictly.

some of the staggering complexities inherent in it (contrary to the beautiful simplicity of the theories advanced in the early days of psychology). There remains to give a bare indication of how the field of attention is determined at a given moment. It is evident that, out of the infinite possibilities of the outer and inner environment, only a small proportion of stimuli ever penetrates the awareness of the individual. What is it that specifies what enters awareness? For even if the stimulus is strong enough, it may be ignored, even if weak, the individual may be aware of it, and similarly with needs. In short, the psychological threshold which borders awareness is continually changing. What changes it? There must be selective mechanisms (and also integrative mechanisms), but psychologists can still only infer what they are by studying their effects.¹⁸ That is why there has been a flood of experiments and theorizing bearing upon attitudes and other determinants of the individual's relation to and interpretation of his environment. The effort to find personality traits is directed to the same end. A large section of this book will also be devoted to this problem. For the time being, however, we shall stop with a general statement, postponing a detailed consideration of what is known about the selective systems until later chapters.

It can be said that selective factors, incorporated somehow into the tissues of the individual as a result of past experience, and operating upon the biological constitution determine what stimuli and needs will enter the field of attention or have an indirect effect thereon.¹⁹ Sometimes the selection may be regarded as permissive, so to speak, that is, no barrier is placed against perception of a stimulus. At other times it is active, as in the case of deliberate reasoning. In any event, it seems clearest to think of the process as one of regulating the psychological threshold.

CONCLUSION

We have attempted to formulate the general framework within which thinking occurs. It functions in terms of the field of attention. On the one hand, the field of attention is defined by the organism's relation to the external environment, the effects depending upon the conditions of the available stimuli and the sensory capacities of the organism. On the other hand, the field of attention is defined by the internal needs of the organism, dependent upon past experience and the current bodily state.

¹⁸ Ultimately, this is a physiological problem.

¹⁹ Such experiments as those of Ansbacher (2), Sherif (22), Bruner and Goodman (6), etc. (see Chap. 13-15) lead to a direct inference that selective factors operate in what superficially appears to be straightforward perception. Work with the Rorschach and other projective techniques bears this out. Both what will be perceived and what will be thought of (and how) are determined at all times by selective factors.

The awareness of the individual includes those processes (externally or internally aroused) which have crossed the psychological threshold. Selective factors determine the threshold, modifying it in various directions. Selection operates in relation to external stimuli and also to internal states. Awareness therefore includes those events which have been selected or which have crossed the threshold.

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some of the staggering complexities inherent in it (contrary to the beautiful simplicity of the theories advanced in the early days of psychology). There remains to give a bare indication of how the field of attention is determined at a given moment. It is evident that, out of the infinite possibilities of the outer and inner environment, only a small proportion of stimuli ever penetrates the awareness of the individual. What is it that specifies what enters awareness? For even if the stimulus is strong enough, it may be ignored, even if weak, the individual may be aware of it, and similarly with needs. In short, the psychological threshold which borders awareness is continually changing. What changes it? There must be selective mechanisms (and also integrative mechanisms), but psychologists can still only infer what they are by studying their effects.¹⁸ That is why there has been a flood of experiments and theorizing bearing upon attitudes and other determinants of the individual's relation to and interpretation of his environment. The effort to find personality traits is directed to the same end. A large section of this book will also be devoted to this problem. For the time being, however, we shall stop with a general statement, postponing a detailed consideration of what is known about the selective systems until later chapters.

It can be said that selective factors, incorporated somehow into the tissues of the individual as a result of past experience, and operating upon the biological constitution, determine what stimuli and needs will enter the field of attention or have an indirect effect thereon.¹⁹ Sometimes the selection may be regarded as permissive, so to speak, that is, no barrier is placed against perception of a stimulus. At other times it is active, as in the case of deliberate reasoning. In any event, it seems clearest to think of the process as one of regulating the psychological threshold.

CONCLUSION

We have attempted to formulate the general framework within which thinking occurs. It functions in terms of the field of attention. On the one hand, the field of attention is defined by the organism's relation to the external environment, the effects depending upon the conditions of the available stimuli and the sensory capacities of the organism. On the other hand, the field of attention is defined by the internal needs of the organism, dependent upon past experience and the current bodily state.

¹⁸ Ultimately this is a physiological problem.

¹⁹ Such experiments as those of Ansbacher (2), Sherif (22), Bruner and Goodman (6), etc. (see Chap. 13-15) lead to a direct inference that selective factors operate in what superficially appears to be straightforward perception. Work with the Rorschach and other projective techniques bears this out. Both what will be perceived and what will be thought of (and how) are determined at all times by selective factors.

Chapter 4. IDEAS, IMAGERY, AND IMAGELESS THOUGHT

To most persons, a "thought" is real. One can readily identify a thought—in its presence or absence, in its clearness or vagueness, and in other ways. Nevertheless, when one seeks to describe the thought itself, difficulties arise. The task is not to express the thought in words but to describe the thought qua thought. It is difficult for a number of reasons. The mental process is so rapid that it is hard to inspect it. It is likely to be so automatic that it can scarcely be realized that a thought has occurred. The meaning of the thought strongly outweighs the nature of the process itself. And there are other reasons.

As we have noted, psychologists have always been tempted by the problem of what thought is. No entirely satisfactory answer has yet been formulated, although the question has been raised in all manner of ways throughout the history of our culture, since the time of the ancient Greek philosophers. Today, however, if one were to glance through the psychological journals he might conclude that there is a temporary loss of interest in the problem, but actually such an impression is erroneous. It arises from two principal conditions. In the first place, the traditional mode of inquiring into the nature of thought and the terminology employed have been inherited so largely from philosophy that it is often difficult to tell whether a psychologist is specifically concerned with the problem. In the second place, the data bearing upon it are in process of collection in areas not identifiable as studies of "thought" to the layman. For instance, little by little, the investigation of the nervous system—the nerve cell and its relation to other nerve cells—is certain to increase our understanding of thought itself. In the final analysis, indeed, we can never hope to comprehend the nature of mental processes until we adequately understand their biology, despite the very active accumulation of data at other levels of observation. It may be observed, further, that psychologists have been concerned for many years with less elusive and more immediate problems. It has seemed more profitable to study what the individual does, that is, more easily measurable aspects of behavior. There is considerable justification for this procedure, since all sorts of nonobjective and complex speculations have surrounded the phenomena of

- 21 SCHILDER P *Mind, Perception, and Thought in Their Constructive Aspects* New York Columbia University Press, 1942
- 22 SHERIF, M A study of some social factors in perception *Arch Psychol*, 1935, No 187
- 23 TIFFIN, J, KNIGHT, F B, and ASHER, E J *The Psychology of Normal People*, rev ed Boston Heath 1946
- 24 TITCHENER E B *A Textbook of Psychology* New York Macmillan, 1910
- 25 VINACKE, W E The discrimination of color and form at levels of illumination below conscious awareness *Arch Psychol*, 1942, No 267
- 26 WOODWORTH, R S *Experimental Psychology* New York Holt, 1938
- 27 WUNDT, W *Outlines of Psychology* (Trans by C H Judd) 3d rev. English ed Leipzig W Engelmann, 1907.

as important to know why and how a person thinks as to know what the equipment is with which he thinks. This third confusion has been most evident in the work of the structuralists, but it is likely to be present in any approach to the problem. Potentially, at least, the clearest distinction in this matter is made in the psychoanalytic approach and in the work done with projective techniques, where there is insight into the dynamics vs the contents. It is essential to understand this distinction for two kinds of problems are involved, one of which may very well be handled through introspective methods, whereas the other may not, at least not in the same sense.

These three confusions were present when the first great effort in modern psychology was made to examine and explain thought scientifically. The consequence, inevitably, was a prolonged controversy regarding the constituents of thought. Today we have a broader view, so that it is possible to see more clearly where learning was confused with thinking, and dynamics with content. Much that was valuable nevertheless resulted from the experimental work which the argument provoked.

The controversy may be stated as one between the view that images and ideas are the basic elements of thought and the view that thought contains, in addition, imageless components. Linked with this argument but usually implicit rather than explicit is the question of how thought is regulated. The outstanding point of disagreement, however, hinges upon the analysis of mental processes. On the one hand is the belief that given proper conditions, any mental process can be broken down into its elements and these described. This is opposed, on the other hand to the conviction that there are unanalyzable aspects of thought. The former position was held indomitably by the structuralists from Wundt to Titchener. The latter position was developed by several different investigators most notably by the Wurzburg school.¹

THE ASSOCIATIONIST VIEWS

The psychological doctrines of the structuralist school owed their origin to many converging movements in philosophy and the sciences. As far as thinking is concerned, however, we may particularly stress the line of development from 'associationism,' which leads directly to E. B. Titchener and his students.

Associationism goes back in recognizable form to Plato (5) and survives hardly today. Indeed it may be remarked that some kind of associationism is essential in the systematic study of man. Otherwise it would

¹ For the complete history see Boring (3), Flugel (9) and Murphy (20). Titchener although guided by his own emphases gives a very thorough account and criticism of these experiments (25).

thought, rendering more difficult an already difficult problem. As a consequence many psychologists have concluded that simpler questions should be answered first.

For the time being, we shall approach the matter historically.

We have asked the question: Of what is thought composed? In the past, attempts to answer it have usually been based upon armchair speculation and/or the method of introspection. It is certainly necessary to obtain at least some data introspectively, since inferences about mental processes from observed behavior, verbal or not, may otherwise be erroneous or incomplete. However, a large part of the early work was handicapped by a failure to take into account three essential features of the problem.

One of these was noted in an earlier chapter, that is, the supposed distinction between mind and body. It has taken centuries of grappling with this relationship to arrive at a point at which a reconciliation is possible. It is reasonably clear now to most psychologists that the "mind" and the "body" are one and the same but that one may describe the phenomena at different levels of abstraction. Thus the mind is a function of the tissues of the body, notably the nervous system. Thought therefore is not something separate from tissues but the result of their functioning. Ultimately, perhaps, it will not even be necessary to use different terms for physiology (and neurology) and psychology, but a single set of terms will be used for both. At any rate, the effort to describe thought apart from the body, or in relation to it, introduced much confusion into the task.

A second confusing element has been a failure, until recent times, to distinguish between thinking and learning. Although, to be sure, the two processes are closely related, it is necessary to realize that learning, broadly conceived, precedes thinking. The former supplies the materials and forms of the latter. Thinking is the use, or reorganization, or application, of what has been learned—a definition which does not exclude the fact that a person may be thinking while learning. Thus, despite their mutual interrelation, two sets of problems arise, one associated with learning, the other, with thinking. Hence when the associationists, for example, attempted to explain the nature of mental processes, they were really dealing with two problems rather than one. Before we attempt to combine learning and thinking into one system, as was attempted by the associationists, we must first identify the principles applicable to each set of phenomena.

A third element of confusion enters because of a frequent failure to distinguish clearly between *what thought is* and *what determines thought*. There has been a tendency, still marked, to separate artificially the motivational and regulatory aspects of behavior from thinking. Yet it is just

all psychologists. Fundamentally, they are conditions upon which depends the strength of connection between ideas (or their counterpart), thus determining (or limiting) the likelihood of their reoccurrence, the pattern of their reoccurrence, and their potentialities for use in new combinations. As previously noted, the same principles have been employed in specifying the conditions according to which the elements originally enter the mind (learning) and according to which they are later available for use in mental processes (thinking).

In the earlier history of associationism, the most frequently stated conditions, or "laws," were contiguity, similarity, frequency, and intensity. Later associationists have attempted to bring their theory into line with modern discoveries by redefining these basic laws and adding others (14, 24). It is not necessary here to embark upon a detailed exposition of the laws; we shall merely set them forth in brief, general terms, following Robinson's formulation (24). The conditions which favor connections between mental processes (in learning and thinking) are, then, as follows:

- 1 *Contiguity*: occurrence of stimuli in close temporal sequence
- 2 *Assimilation or similarity*: generalization, or transfer, among processes, so that a present process may, and does, form a connection with the traces of past processes which are similar to or identical with it
- 3 *Frequency*: exercise, or repetition, of a connection
- 4 *Intensity*: strength or vividness of a variety of conditions under which the learning occurs³

A moment's reflection will show that the associationist viewpoint readily lends itself to fruitful experimentation and theorizing.⁴ Any number of experimental paradigms are suggested by its tenets, no matter how formulated.

We have summarized essentially what Robinson calls an "analytic associationism," the approach presently to be pursued further in the work of the structuralists. However, there is also a synthetic approach, exemplified by Hollingworth (15), which concerns itself with recall—the process of the present moment—rather than with learning, which is implicitly accepted rather than explicitly analyzed.⁵ Hollingworth makes use of Hamilton's concept of "redintegration." The term signifies that

³We omit several other laws suggested by Robinson (24), such as the laws of duration, context, acquaintance, and composition. Any full discussion should deal with them, however, since they are important for vitalizing associationism especially to bring in gestalt findings.

⁴For instance, much of the work of Hull and his coworkers falls into the associationist framework, as does that of McGeoch and his students.

⁵Gestalt theory, too, emphasizes the present organization.

be impossible to account for the complex effects of experience. There must be, in short, connection between *something*.

What, then, is associationism? Broadly defined, it signifies "the establishment of functional relations among psychological activities and states in the course of individual experience" (24, p. 7). Such an inclusive definition covers all the variations which have been expounded. They all represent the effort to explain the composition of mental processes,² although frequently, as noted above, without distinguishing the structure from the functioning. Hence at one and the same time, association was invoked to account for the conditions under which mental elements are formed and to explain the process of thinking itself (cf. 18, pp. 195f.).

Generally speaking, associationism is a mechanistic doctrine, conceiving of mental processes as the more or less automatic elaboration—combination and recombination—of materials derived from the sense organs. The development of the theory centers around the attempt to reduce the mechanism to its simplest, most concrete terms and to discover the "laws" according to which it works.

In the premodern theories which have already been mentioned (Chapter 2) thinking was described according to classifications of functions, rather abstractly conceived. Thus thinking was classified into the forms of recollecting, imagining, judging, generalizing, reasoning, etc. Each such function had its own characteristics and place in the flow of events included in the 'mind'.

A basic element was needed in terms of which the outer world could have its internal representation, and which could serve as a unit for the complex structure of the mind. The mind had to consist of *something*. The unit so required was called the "idea." Today we are so accustomed to thinking in neural terms, at least implicitly, that it is extremely difficult to understand what was meant by an idea. It really was a "construct," or an attempt to give a name to what is involved in thinking. In general, the term 'idea' referred to any cognitive event. To be more explicit, it meant a recurrence of previous experience, either in the form of exact replicas or of combinations not corresponding to reality. Sometimes it was supposed that ideas may exist and be known by an individual without having an origin in prior experience. Actually, it was not necessary to explain what an idea is, once it was postulated as a fact, for it could be used as a unit in accounting for the functions of the mind. These functions, then, are a matter of a more or less mechanical arranging and rearranging a compounding of the basic units into patterns, or their fusion into new components.

The many laws relating to the compounding of ideas are familiar to

²Not all psychologists, however, would use the term mental.

tempted to reduce the process to such simple terms that a report could be given with a minimum of delay

Analysis of mental contents by this method seemed to reveal that all mental processes are composed of simple, irreducible elements, namely, sensations, affections, and images, each with characteristic dimensions, or "attributes." Sensations, the basic data arriving in the sense organs, and classifiable accordingly, are marked by specifiable quality, *e g*, cold, blue, salt, by intensity of a given amount, by variations in clearness, and by a given duration. They are compounded into perceptions, following the laws of such a mixture. Similarly, affections, with their describable attributes, lacking the dimension of clearness, are compounded into feelings, or simple emotions. Images, with which we are concerned here, are derived from sensations. They constitute the elements of which ideas are composed and thus form the basic contents of thought. The differences between sensations and images grow out of their relationship, for an image has less distinctive quality, less intensity, and shorter duration than the corresponding sensation.

The structuralists explained all thinking as the occurrence of images, combining and recombining, according to requirements. Memory was said to be characterized by images with personal reference, representing definite incidents in past experience. The images of imagination, on the other hand, lack personal reference and definite associations with past events. Thought, as distinct from memory and imagination, occurs in the form of words, although the words can readily be converted into the relevant images. To quote Titchener, "thought is the verbal counterpart of active imagination. Active imagination is thinking in images, thinking is active imagination carried on in words" (27, p. 213). This conception lends itself admirably to argument, forming one side of the controversy over "imageless thought," since it was soon found that thinking includes more than the mechanics of imagery and verbalization.

IMAGERY

Before turning to this debate, however, let us briefly pause to discuss imagery, because in the controversy images themselves often get overlooked. Nevertheless, they are facts.

Such experiments as those of Galton (10), Betts (2), and Perky (23) demonstrate that images exist and that it is possible to determine, in more or less quantitative terms, their characteristics. These same experiments also reveal the similarities and differences between imagery and perception. One really need seek no farther than his own experience to find evidence of imagery, perhaps everyone has noted the occurrence of images at some time in his own mental processes. They commonly occur in

"a complex antecedent, ABCD, instigates a consequent, XYZ. Thereafter the consequent XYZ, or one belonging in the same class, may be instigated by the detail A, or a detail belonging in the same class, by virtue of the historic participation of A in the situation ABCD. A partial stimulus is substituted for a total antecedent" (15, pp x-xi). Thus a relatively slight cue, or stimulus, whether external or symbolically represented, may arouse a complex pattern, of which the cue was originally only a part.

Three points are perhaps most significant in this theory, namely, (1) that present thinking is determined by antecedent events which are complexly interrelated in the mental context, (2) that thinking is not a simple 1-to-1 reinstatement of a given event by a given stimulus but the activation of patterns by cues to those patterns, and (3) that substitution of a fragment of a situation may evoke the total, that is, the representation of a complex event or series of events by a detail.

THE STRUCTURALIST VIEW

The associationists have concentrated on the "how" of thinking, whereas the psychologists who developed Wundtian psychology to the greatest extent interested themselves in the "what." They more or less accepted the associationist explanation of the how, which corresponds to their problem of synthesis ("the laws of connection of the elementary mental processes," 26, p 38), and set to work on the problem of analysis. Much influenced by the elementaristic approach of the other sciences, they sought, and believed they found, the simplest components of mental experience. The most emphatic of these men was E. B. Titchener, who for a generation ruled at Cornell University.

Wundt's laboratory at Leipzig (from 1879) concerned itself with problems of sensation and perception, reaction time, association, feeling and attention. Titchener, who studied at Leipzig, carried these problems forward and essentially limited himself to them (from 1892). The body of fact and theory which resulted may be summarized as it bears on the present subject.

First, as to method, these early investigators developed the strict and exacting technique of introspection. The subject of an experiment had, figuratively, to stand back from himself and examine what existed in his mind under specified conditions of stimulus and response. He then reported his observations in as exact terms as possible. Such a procedure required that the observer have careful training in order to acquire objectivity and the ability to note those phenomena under study. In practice, of course, introspection means retrospection, since a mental process must occur before it can be reported. However, the structuralists at-

Experiments, such as those of Galton (10), Betts (2), and Perky (23), show that individuals differ widely in imagery, not only in frequency but in the character of the images themselves. In general, however, these studies show that images tend to have fewer details than the original perceptions and to be vaguer and weaker, although many degrees of these characteristics have been observed.

We shall find that no mental process occurs in isolation, *i.e.*, is independent of the organism's total functioning. It may be inferred that images are related to the individual's needs and attitudes, as well as to other less specifiable conditions. Thus, even a memory image undergoes dynamic change over time and may be so distorted, accordingly, that it scarcely resembles the original perception (see Bartlett, 1, Carmichael *et al.*, 6, and Gibson, 11).

The study of imagery has lost its former interest for psychologists, yet it has by no means been exhausted as a field of research. Many interesting problems remain for the curious investigator who might not be averse to using variations of the introspective method. For example, very little is known about what conditions increase (or decrease) the frequency and richness of imagery, a problem of significance in creativity. Nor is much known objectively, apart from Galton's suggestive experiments, about individual differences in imagery and factors to which such differences may be related.* Still another problem susceptible to research is that of changes in the nature of the images themselves. Perhaps this problem is an analogue to some of the recent studies of perception. It may be added that research with the Rorschach and other projective techniques may ultimately throw light on imagery, at present, such research appears to be oriented in a more practical, diagnostic direction (see Chapter 10).

IMAGELESS THOUGHT

The notion that thought is not solely reducible to images arose from several sources including observations by Binet and Woodworth as well as by members of the Wurzburg school, with whom this conception is generally linked.

Galton (10), as noted above, carried out extensive experiments on imagery, the results of which contributed to the view that thought is not only a matter of images. He asked a variety of people to bring to mind

* A study by Gordon (13) illustrates how systematic studies of imagery may increase our understanding of thinking in many areas. She shows that people differ in the degree of their control over imagery and relates this condition to previous experience. This finding contributes to a clarification of concept systems which include more than the verbalized response (see Chaps 7 and 15).

fantasy and dreams, even if not as vividly or frequently as in everyday life

For the sake of convenience, various kinds of images have been differentiated.⁶ The *afterimage* is in reality not a true image but an after-sensation, resulting from the persistence of activity in the sense organ after the physical energy has been removed. For example, visual afterimages are easily observed when one stares at a light and then looks at a blank wall. Other after-sensations have been described in other modalities. Such "images" are more properly designated "perceptual phenomena."

Memory images are, as the name implies, the recall, in more or less exact form, of a previous experience or sensation. An outstanding feature of such images is a sense of familiarity or recognition of that past event. The image is characteristically much less clear and detailed than the original sensation.

Eidetic images are extremely vivid memory images, more frequently found in children than in adults (16, 17). So closely do the images resemble perceptions that a person may point to an object as if it were really there. However, unlike in *images of hallucinations*, the individual does not mistake an eidetic image for reality.⁷

Imagination images are also memory images, but instead of representing the recall of former experiences, thus corresponding in details to the original perception, they are typically combinations of previous experiences. Often they are quite unusual in nature, as in dreams, but nevertheless do not contain anything new or beyond the actual knowledge of the individual. It should be pointed out that imagination images may be constructive and voluntarily directed, as often happens in creative thought, as well as aimless and rather vague, as in daydreams. Images are thus frequent in all forms of imaginative thinking, although it is doubtful that they are essential to it.

Finally, we may mention *hypnagogic images* and *hypnopompic images*, which occur in the former instance during the drowsy state between waking and sleeping and in the latter between sleeping and waking. They are memory images of a vivid nature, which are frequently numerous and varied.

⁶ Cf. English (8), and Boring, Langfeld and Weld (4, Chap. 14).

⁷ It is important to distinguish in the study of mental processes between eidetic images, hallucinations, and illusions. An illusion is a mistaken perception but nevertheless a response to an actual (physical) stimulus. A hallucination is an imaginary (or false) perception, i.e., not a response to an actual (physical) stimulus. An eidetic image is a primary recall of a prior perception. Whereas illusions and eidetic images are essentially normal phenomena, a hallucination is essentially abnormal, usually associated with mental (or emotional) disorders. Note also that a delusion is another abnormal phenomenon—a false belief rather than an image or perception.

as a result of past experience, such systems constituting more than the mere counterparts of perceptions, as the term "image" implies

We shall, in the course of this book, pursue both these conclusions much farther

FURTHER WORK ON IMAGELESS THOUGHT

Titchener, as a scientist, accepted the Wurzburg findings but not their conclusions. He put it this way

Some psychologists maintain, definitely, that there are awarenesses of meaning, and awarenesses of relation, which cannot be reduced to simpler terms, but must be accepted as non-sensory and imageless components of the higher mental processes. The author believes, on the contrary, that the attitudes, so far as they are conscious at all, are always analyzable [26, p. 507].¹⁰

One of his students attempted to subject conscious attitudes to a thorough introspective analysis to see if they could, indeed, be reduced to simpler terms (7). She carried out a detailed series of experiments on perception, recognition, and verbal processes, in which the subjects were required to report their experiences, constantly striving to reduce them to their lowest terms. The result was a long list of attitudes, "analyzed" largely into feelings, as well as images. She found no evidence that her subjects, when properly instructed, could not describe their mental processes and concluded that there is no such thing as imageless thought. The trouble with other experiments, she supposed, was their failure to subject experience to an intensive enough analysis. She states that "the general conclusions to be drawn from the sum of our results is that conscious attitudes can be analyzed into sensations and images and feelings, or traced genetically to such analyzable complexes, and therefore do not warrant the proposal of an additional element."

One may remark the criticism of Ogden (21) that, at Cornell (Titchener's laboratory), images were reported because subjects were trained to find them.¹¹ More light is shed on this factor by Woodworth's discussion of imageless thought (28). He points out that a thought may be primarily imageless and that "it attaches itself secondarily to a word or other convenient symbol." In recall, therefore, an introspection is necessarily retrospective, the mental process to be analyzed could very readily

¹⁰ There was an inclination on the part of some psychologists, who remained in the structuralist tradition, to add the imageless thoughts as a fourth element, in addition to sensations, images, and affections (cf. e.g., Ogden, 22).

¹¹ It is interesting to note, however, that Titchener, himself leveled the same criticism against the Wurzburg investigators (25).

a picture of their breakfast tables and then quizzed them on the attendant images and their imagery in general. The wealth of material which he collected contains many points of interest. He disclosed how widespread and varied imagery is in the general population, especially among women. On the other hand, he found that many subjects denied having images. Indeed, scientific men, particularly, appeared to have poor and feeble imagery. Galton concluded that "an over-ready perception of sharp mental pictures is antagonistic to the acquirement of habits of highly generalized and abstract thought" (10, p. 60).

Galton's experiment cast doubt, at least, on the universality of imagery in mental processes and suggested that thought may occur through other means. The Würzburg investigations beginning in 1901 went much farther. In keeping with the practice of the time, they employed the introspective method and, through it, found imageless components of thought.

In one experiment, Marbe discovered that a subject could readily judge the heavier of two weights without being able to state how the judgment was made or to describe the content of his mind during the judgment process. Certainly no images seemed to be present. He advanced the notion of *Bewusstseinslagen* ("conscious attitudes") to account for the mental process. Orth showed that conscious attitudes are imageless states, not analyzable in Titchenerian terms. Watt and Ach elaborated the discovery, explaining the imageless state as a matter of *Einstellung* ("set") and "determining tendency," or of conditions which correspond to a preparatory, selective mechanism permitting thought to occur without the manipulation of images. Thus in a judgment situation, if the subject is prepared to make a response (and there is always some readiness in this sense), the answer is there already, so to speak, and merely requires the occurrence of the stimulus in order to appear.^{*}

The significance of these Würzburg experiments does not lie in the disproof of images, for that, of course, was not done, images exist and constitute a very important feature of thought. The importance of the experiments may be said to rest in the following points:

1. Contrary to the Wundtian tradition, so persistently maintained by Titchener, they demonstrated that thought processes consist of more than images, and that thinking at least of some kinds, may and does occur without the mediation of images.

2. The advocacy of factors such as set and determining tendency was a recognition of regulatory systems inhering in the individual's structure.

^{*}Note the similarity to James's transitive states and Galton's antechamber (cf Chap. 3).

grasped and accepted by the subject, *i.e.*, in the first period, the thought process would occur without further "content." Hence, the concept of *Einstellung* was proposed—the *Aufgabe* established a "set," or readiness, which regulated the selection process so that the response merely had to be carried through. Adding to this the determining tendency of Ach, we might say that the set is the conditions in the subject established by the task or instructions which facilitate some responses and inhibit others, thus determining or directing the response.

May, in 1917 (19), further explored the concept in experiments on controlled association. He presented the following summary of conditions included in set:

Set	{ General	Motor—adjustment	
		Mental—predisposition	
	{ Specific	Motor— <i>Einstellung</i>	{ 'Task set'
		Mental—	{ 'Task notion'

By "task notion" he meant "the task words as understood or actualized by the observer," whereas "task set" was defined as "preparation or preparedness of the observer to respond when the stimulus appears." He proposed to study the first stage rather than the third, since the significant problem seemed to concern the establishment of the set. Thus his experiment consisted in varying the length of the first period and the mode of presenting the task. He concluded that the task notion is the process of understanding and accepting the task (here, grasping the relation to be found between stimulus and response) and that the task set is the establishment of determining tendencies. Physiologically, he suggests, the former is a distributing mechanism, the latter a converging mechanism. "The predominance of task notion in the fore period¹² tends to favor facilitation in the main period,¹³ and task set in the fore period tends to favor inhibition in the main period . . ."

Despite the numerous ambiguities in these concepts, they have been widely applied (cf. Gibson, 12), and, with some care in precise terminology, the conclusions of Watt, Ach, and May may be applied broadly to thought processes in general. Today Woodworth (30) is the foremost advocate of the concept of set. He has used it to define the relation between the organism and its environment.

But even more widely, the modern study of attitudes, frame of reference, and other aspects of the establishment and of the nature and functioning of the internal systems which regulate thought rests upon the same principles (see Chapter 15).

¹² Before the stimulus word appears.

¹³ Corresponding to Watt's third period.

attach itself secondarily to an image or other phenomenon expressible in words Betts (2) developed this interpretation still further. We may add that what we now know about falsification in perception and memory makes it possible to understand how an observer could find images whenever he wished

Although experiments and argument continued for many years, we have dealt with the problem sufficiently for our purposes. We may well agree with Woodworth (29, pp 788-789) that, in some respects, the issue is insoluble. In any event, it is essentially a futile debate. We may certainly accept the reality of images and at the same time accept the facts uncovered by the exponents of imageless thought. Both are necessary for an understanding of thought. To us, to wonder whether meanings can be known without images seems less important than the conclusion that mental processes, whether images, meanings, or anything else, are the result of and regulated by mental systems not understandable in terms of the "conscious" content. It is here that the Würzburg school made its greatest contribution.

LATER DEVELOPMENTS OF DETERMINING TENDENCY

Modern psychology has acquired a peculiar dependence upon the concepts advanced in studies of imageless thought, especially in the developing fields of personality and social psychology.

It was pointed out above that Watt, in 1904, suggested the term "*Einstellung*," or set, to explain how thought could occur without images. He used the method of "fractionation," in which the mental process was subdivided into four stages, in order to simplify the subject's introspection. It was supposed that in this manner the subject could observe only one stage at a time and that, in consequence, a fuller report could be made. The stages were as follows:

- 1 Preparatory period—the subject awaits the stimulus
- 2 Appearance of the stimulus—the subject is stimulated
- 3 Search for appropriate response—the response is selected
- 4 Occurrence of response—the actual response is carried through

Although Watt was studying a typical reaction-time situation, it is evident that this scheme may be hypothetically generalized to fit any situation.

It was expected that the third of these stages would reveal the crucial process in the thought itself. In actuality, however, the subject found the third period the most difficult of all to observe, indeed, there seemed to be no content. It appeared that, once the task (*Aufgabe*) had been

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Several important conditions definitely limit the experimenter's efforts to deal with the physiological nature of thought, and these are, no doubt, responsible for the neglect, beyond the probability that other problems have temporarily become dominant. In the first place, it is apparent that one cannot experiment directly with the human brain and nervous system, as, for instance, Lashley has done with rats (20). Were one able to do so, many questions might be answered, but it is not likely that society will ever permit such a procedure. Hence one line of evidence has had to wait upon brain pathology and treatment (such as the currently significant studies of the results of frontal lobotomy and lobectomy). Even in such studies, the evidence depends to a greater or lesser degree on inference. The "experiment," by its therapeutic nature, is not one in which refined methods are often possible, namely, the tedious and exacting, though rewarding, control of variables, repetition of cases ad libitum, etc. The limitations of inference are still greater in the case of experiments on animals, which cannot verbalize. Even if inferences are ventured, they are likely to be greeted by a barrage of criticism, based more on the reluctance to see the human being as an animal than on more objective grounds. Nevertheless, it seems to the author that psychologists must begin to accept the inferences from animal studies to a greater degree than they already have, in the study of thinking no less than in other areas. Similarly, it is incumbent upon comparative psychologists to develop further the study of "thinking" in animals.

However, despite these handicaps in the way of direct observation of brain activity, efforts of a pioneering sort have been made to obtain indirect evidence. In this category belong the studies, for instance, of Jacobson and Max (see below). Here arise many technical difficulties of experimental procedure, of apparatus, and of recording. Furthermore, much inference, as we shall see, enters into the interpretation of these results, too, rendering them inconclusive. As we develop the subject in the pages to follow, the nature and magnitude of these difficulties will be increasingly apparent.

SOME GENERAL CONSIDERATIONS

We may begin by repeating with William James that "the first fact for us . . . as psychologists, is that thinking of some sort goes on" (18, p. 224). Simple and obvious though this observation may seem, it needs to be stated. Ultimately, it is the fact to which we must always return.

It is a fact, but what *is* thinking? Here we have the two apparently different sets of phenomena that we have already noted, *i.e.*, (1) the psychological processes and (2) the neural processes which, in the last analysis, *are* the thinking as much as are the former.

Chapter 5. THE MECHANISM OF THINKING

Until the present point, we have been concerned mostly with the historical origins of the psychology of thinking. We may now turn our attention to the extraordinarily difficult problem of how thinking occurs at all, *i.e.*, what is the organic mechanism which forms the basis for thinking?¹ It is of course possible to ignore this question, as has often before been done. For example, we could assume that thought is something different from organic functioning and hence should be separately and differently treated. This position, however, is no longer acceptable to the psychologist. A second possibility would be to admit the organic basis but to ignore it as irrelevant, or at least nonessential, to the adequate description of the behavioral or psychological phenomena of thinking. This position, too, must be rejected as unsound. At no point is it really permissible to claim that functioning of the organic system is irrelevant for indeed it is ultimately essential to the understanding of our problem. It is, however, necessary to qualify our interest in the organic basis of thinking, because we are, as yet, quite ignorant about it. Far more progress has been made in understanding the behavioral manifestations of thinking than in understanding its organic nature, for the rather obvious reason that the former are much more easily observed than the latter. Therefore, the present chapter will be a question rather than an answer.

EXPERIMENTAL DIFFICULTIES

Why is it that we cannot more conclusively and accurately describe the organic basis of thinking, as we can, for example, that for digestion or even the hunger drive? One reason, perhaps, lies in the relative neglect of the physiological study of thought.² Although a considerable amount of research bearing on the matter has been done on animals, as yet only a few tentative steps have been taken to apply this material to human behavior (*e.g.*, 31, 35). We may suppose that, before many years are past, psychologists will turn their attention to the problem once more.

¹ Or, it might be stated the organic mechanism which is thinking.

² Cf. *e.g.*, C. T. Morgan's *Physiological Psychology* (26). Here only a small fraction of the whole volume is devoted to the subject although of course other sections may, by inference, be related to it.

differences among simple, choice, and associative reactions, or between a reflex and a choice.

Turning now to the physiological aspect, we may point out two problems suggested by the question mark: the first is what organic materials, so to speak, there are which can be responsible for the intervening processes; the second is how these materials can work in fulfilling the role ascribed to them.

It is generally agreed that the materials for thinking are to be sought in the nervous system and primarily in the cerebral cortex. The fundamental facts, then, concern the units of the nervous system, the neurons, and their organization in the system.⁷ The general relationships thus revealed correspond in a preliminary way to the diagram already presented, as follows:

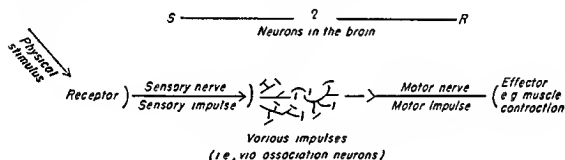


FIG. 3. Fundamental relationships in the neuromuscular system assumed to be involved in thinking.

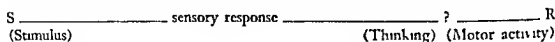
In short, the neuron circuits of the cerebrum represent the past experience of the organism, as a consequence of the modification of the neurons themselves and of the relationships between them. Thinking, then, consists in the activity of such circuits, on the one hand initiated and continually influenced by impulses from the receptors and, on the other, leading to the sequence of effector activity, that is, muscular and glandular response.⁸

However, the neural activity corresponding to thinking does not have a specific locus in the brain (9, 20, 21). Unlike the sensory and motor

⁷ A general knowledge of these facts is assumed in the reader.

⁸ It is pertinent to ask whether the R is always essential. That is, can the process stop with the ? or mental processes? Perhaps it can, but it seems far more meaningful to represent the motor response as the final term in the sequence. The diagram, of course, is too simple, there is seldom, or never, merely an S, a ?, and an R. Nevertheless, in the present state of our knowledge, the evidence suggests that thinking subserves the adjustment of the organism to conditions of the external and internal environments. Hence it is preceded by instigators, so to speak, and accompanied and followed by activity, however remote the response may be from the instigator, the response may be with respect to the thought processes

From the psychological standpoint we may say that thinking is manipulation of the environment wholly or partially without overt activity. Further, we might add that, in thinking, the environmental facts manipulated are either wholly or partially absent from present perception, i.e., there is always some symbolic activity involved. In short, thought processes intervene between sensory response and motor activity.¹ The relationship may be schematized as shown in the accompanying diagram:



The question mark in the diagram represents what it is that we are attempting to describe when we speak about thinking. From the psychological standpoint, we fill in the diagram with descriptive words like recall, abstraction, or reorganization. The processes designated by such terms have certain characteristics, among which are the following:

- 1 They are representative of past experiences of the organism.⁴
- 2 They are "implicit," or inner activities, not observable in overt behavior.⁵
- 3 They have a selective function, that is, other things being equal the stimulus is interpreted in a given, definite way, and a given, definite response occurs. Nowhere is this selective function more evident than in an ambiguous situation (cf. Chapter 11).
- 4 They may (and, in so far as they correspond to what we include under the rubric 'thinking,' do) delay the response for considerable periods of time.

All these characteristics are inferred psychologically, from what we observe about the organism's behavior. The inference, however, is based upon good evidence. For instance, the evidence for representation of past experience depends upon the observation of what an organism presently behaving has done in the past; the inner activity is demonstrated by introspection and by the fact that some condition not present at the time of adjustment influences response (26 p. 543); the selective property can be shown experimentally wherever a stimulus may be "seen" in more than one way,⁶ and the function of delay requires for its demonstration merely a comparison of different SR situations, for example, the time

¹ Actually, between perception and motor response however perception is so influenced by the processes which we link with thinking e.g., past experience that it cannot meaningfully be distinguished from them.

⁴ Cited by Munn (27 p. 333).

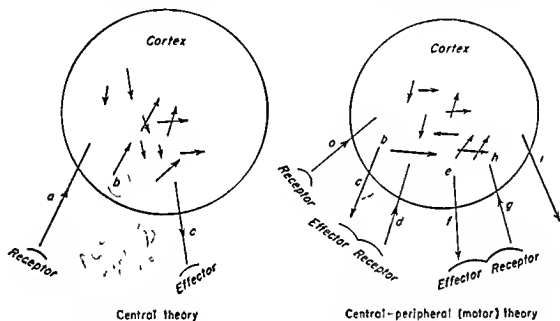
⁵ *Ibid*.

⁶ Actually, these conditions apply to a greater or lesser degree to every situation.

The two theories are diagrammed in Figure 4. The diagram, which of course vastly oversimplifies the neural relationships, may be interpreted as follows.

Central Theory. A stimulus arouses in a receptor an impulse, *a*, which is transmitted to the cortex. In the cortex, the impulse is propagated along a series of neurons, *b*, until, some time later, it leads to some motor impulse, *c*, to an effector, at which time the response occurs. Thinking would correspond to the nervous impulses in the cortex, *b*.

Central-Peripheral Theory. In this case, the sensory impulse, *a*, is transmitted to the cortex, where, more or less immediately, an appropriate selection occurs, *b*, and there is initiated a motor impulse, *c*, to some ef-



Central theory

Central-peripheral (motor) theory

FIG. 4. Schematization of two types of explanation of thinking (adapted from Dashiell, 6, p. 567).

factor. The activity of the effector (say, a muscle) arouses a (kinesthetic) sensory impulse, *d*, which in turn goes to the cortex, where by means of association pathways, etc., the process is repeated. However, no visible activity occurs, for the impulses *c*, *f*, *i*, etc., arouse only sufficient response in the effector for the kinesthetic impulse to arise; i.e., there is only a series of "implicit" muscular responses. Thinking would correspond, then, to a series of perceptions following impulses *a*, *d*, *g*, etc., or, so to speak, a reoccurrence, in a much-reduced form and in various combinations, of past experience (subject to whatever modifications, of course, the system may undergo in the course of time).

The central theory expresses the common-sense interpretation that thinking goes on in the "mind." It also underlies most of the philosophical attempts to explain thinking. In its simplest form, however, it does not

functions, which have definitely specifiable locations in the cortex, the processes involved in thinking appear to be highly generalized. It is therefore very likely that, from moment to moment, thought processes depend upon the total organization of neural activities as it shifts and changes. Rather than conceive of thinking in terms of definite neuron arrangements and connections, we should probably think of it as depending upon complex patterns or circuits or upon relations between the active currents in the cortical tissue. The same should be said for memory which, instead of being a kind of specific record "written" on specific neurons, may very well be the establishment of a more or less intricate relationship within a pattern of neurons, perhaps, in the case of a complex memory, scattered over the entire cortex.

Whatever the actual nature of the neural organization of thinking, it is a dynamic system. That is to say, the parts are in active relationship with each other, and a change in one part will effect changes in other parts depending upon the magnitude of the change and the closeness of the relationship. Inasmuch as changes are continually occurring, *e.g.*, impulses entering from the receptors, we may suppose that there is continual instability resulting in continual activity. Therefore, not only are the thought processes themselves active but there is a continual modification of the traces of past experience. Thus, again, even a memory is active, not just a static record, for it may continue to influence neural processes by its relation to other parts of the system and itself may undergo modification as other parts influence it (1, 7, 19, 28, etc.).

Finally, it should be noted that other parts of the organic system, apart from the brain enter into the processes of thinking (29, 30). Bodily needs, emotional and affective states, etc., all enter into the course of thinking by virtue of their neural communication with the brain. In short, in a very genuine way the organism thinks with its whole body.

THEORIES OF THE THINKING MECHANISM

Theories of two general kinds have been advanced to explain how the mechanism of thinking may work (6). The first of these may be called the central theory and the second, the "central-peripheral theory," or motor theory. The problem which these theories attempt to solve, in its final analysis, is that of how the intervening processes which have been noted control and direct a response sequence, even though no apparent new stimuli from without fall upon the organism to bring about a new response. Or it may be stated as a question of how a train of organized manipulation of the environment, wholly or partially utilizing past experience, may occur without overt activity and without the physical presence of the prior environmental objects or conditions.

It is evident that such a mechanism could be the means whereby protracted periods of organized and coordinated behavior take place. Learning, as evident in the regulation of the habit pattern, is explained. We might inquire, now, what happens if the individual, instead of carrying out a series of habitual acts, only imagines he has carried it out. A simple extension of the theory offers the hypothesis that the mechanism is identical, except that the muscles do not contract visibly but only enough to arouse the requisite kinesthetic impulse.¹⁰ In any event, the role which James assigned to kinesthetic impulses has been elaborated by later psychologists.

The theory which most explicitly proposed a motor basis for thinking was advanced by John B. Watson.¹¹ In keeping with his fundamental approach to psychological problems, he searched for some sensorimotor explanation for thinking and found it in the mechanism of speech. The main points of his argument run as follows:

1 The individual acquires language habits as a result of conditioning during the socialization process, *i.e.*, words come to be substitute stimuli for objects and situations in the environment.

2 Memory is simply the retention of verbal habits, *i.e.*, the preservation of the sensorimotor relationships which subserve the speaking of particular words.

3 As time goes on, verbal habits become perfected and automatic, with the result that less motor activity is necessary for their occurrence, *i.e.*, they may occur implicitly as well as explicitly.

4 Since words are substitutes for objects, the individual may act as though an object is present when, in fact, it is physically absent, by using the substitute for the object, namely, a word.

5 The word need not be spoken aloud but may be "spoken" subvocally, *i.e.*, the implicit movements of the muscles activating the speech mechanisms may, as suggested in point 3, take the place of overt language.

6 A whole chain of such implicit responses may occur, as suggested by James, since the kinesthetic impulse of one subvocal act may serve as a stimulus for the next act. It is a series of such subvocal activities which corresponds to thinking. In short, thinking is "talking to oneself," or, better, the implicit movements of the muscles involved in talking.

7 With continued practice, which, indeed, occurs practically con-

¹⁰ In James's view, perhaps it would be necessary also to raise the activity to an ideational level.

¹¹ This summary of Watson's theory is derived from 37, Chap. IX and 38, Chaps. X and XI. It should be noted that Titchener anticipated this view quite explicitly (34, pp. 176ff.)

really explain anything but constitutes an indication of ignorance about the mechanism actually involved. On the other hand, such is, in fact, our ignorance that we cannot abandon it. Evidence may ultimately prove it to be correct by specifying how it works.

We shall devote more space to the central-peripheral theory. It has had an interesting history.

THE MOTOR THEORY

William James's chapter on habit (18, Chap. 4) contains the essential groundwork of all later versions of the central-peripheral mechanism of thinking (although, to be sure, he does not mean to explain thinking by it). A habit is a series of more or less automatic actions, carried out in a more or less prescribed way (James makes allowance for variations in the pattern and for change in habits). At first, in the learning stage, each part of the sequence may be regarded as a separate act, a response to an

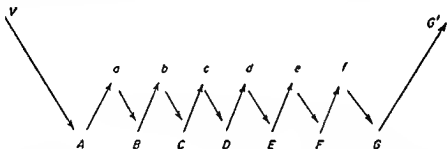


FIG. 5. A diagram to show the possible kinesthetic basis of habit (from James, 18, p. 116).

appropriate stimulus. As time goes on, with repetition of the acts involved, the separate responses are linked together and follow each other with hardly any attention on the part of the organism. Each act becomes the instigator of the next act in the series, a series of reflexes, so to speak. As James himself puts it, "The impression produced by one muscular contraction [serves] as a stimulus to provoke the next, until a final impression inhibits the process and closes the chain" (18, p. 108). The actual instigator for the next link in the chain, then, is the kinesthetic impulse, aroused when the muscle contracts. To illustrate his point, James gives a diagram, Figure 5.

In Figure 5, *V* is the "command to start," that is, whatever it is that initially sets off the sequence; *A, B, C, D, E, F, G* are a habitual chain of muscular contractions; *a, b, c, d, e, f* are muscular (kinesthetic) sensations; and *G'* is the final intellectual process, which brings the series to an end.⁹

⁹ In James's view, *a, b, c*, etc., are all subideational, that is, probably subcortical.

Thus thinking, from moment to moment, may be verbal-kinesthetic, non-verbal-kinesthetic, or emotional (visceral) Watson concludes that "*we could still think in some sort of way even if we had no words*" (38, p 268)¹²

A number of psychologists in the behavioristic tradition continued to develop and refine this strictly motor theory (4, 5, 36) The statement by Washburn (36) is particularly clear, careful, and thorough Although she rejects complete affiliation with the behavioristic view, in effect, her "system of motor psychology" is an extension of the theory we have just presented Thus, she found the basis of learning to be the conditioning process In the first place, "substitute learning" occurs, in which there is a loss of an original response and the acquisition of a response originally belonging to another stimulus In the second place, "system-forming learning" develops, in which external stimuli drop out rather than movements, that is, a series of movements gets linked together, with the kinesthetic impulses of a given movement serving as stimuli for the next movement, in the manner noted above An idea has its motor basis in a tentative movement (or implicit muscular response), "which originally occurred during attention to an external stimulus, and is revived through the occurrence of other tentative movements that became organized with it into a system" (36, p 87) Thinking involves simultaneous and successive systems of tentative movements, and also an inner muscular tension, or drive, which represents the problem idea toward the solution of which the activity is directed

EXPERIMENTAL EVIDENCE

Several investigators have attempted to test aspects of the motor theory R S Clark (3) sought to obtain a variety of objective measures of what goes on during thinking The subjects (10 graduate students) solved problems during five successive sessions¹³ Data, at various sittings, were obtained on imagery, overt movement, the effects of distractions, and several physiological changes (respiration, arm volume, horizontal and vertical movements of the larynx, and tongue movements) She found, in addition to the occurrence of imagery, that a considerable amount of movement accompanied the solutions Some of this was apparently a matter of "bodily attitudes of adaptation," which she suggests may aid in concentrating on the problem There were also many minute movements

¹²See Murphy (28, especially pp 259ff), for another version of this theory

¹³Examples of the problems (1) How would you plan a trip to Iceland? (2) If you were going to be away from all civilization for a year and could take only four books, which four would you take? (3) Will you make an economic prophecy in regard to future methods of heating?

tinuously, even without deliberate effort on the part of the individual, "silent talking" improves to the extent of reaching the complexity, speed, and efficiency of the adult's

8 In using the function of silent talking, as in a problem situation, thinking is essentially a trial-and-error process, analogous to the behavior observed when a person talks aloud while seeking for an answer to a question

9 A course of thinking is completed when the original stimulating conditions are satisfied, *i.e.*, an adjustment is achieved which renders the initiating stimulus inoperative

Here, then, is the gist of Watson's explanation of thinking. It is apparent that he allows no place for "meaning" in the philosophical sense. The human being, as well as the animal,

'means' what he does. It serves no scientific or practical purpose to interrupt and ask him while he is in action what he is meaning. His action shows his meaning. Hence, exhaust the conception of action—*i.e.*, *experimentally determine all of the organized responses a given object can call forth in a given individual, and you have exhausted all possible "meanings" of that object for that individual* [37, pp. 354-355]

✓ Even if we accept Watson's view on this point—which the present author does, in its essentials—the question of meaning is nonetheless important. It may be stated as the problem of how a given individual's responses are acquired and organized and how this acquisition and organization determines the responses which occur. This corresponds to our conception of the mental context, derived from learning and functioning through memory. Since, however, we are now primarily concerned with the mechanism of thought, we shall postpone further consideration of meaning, or context, until later (see Chapters 13 and 15).

A more serious criticism of the theory is that thinking involves more than implicit vocal habits (*cf.*, *e.g.*, Bartlett and Smith, 2). Watson himself recognized the validity of this point and himself attempted to reconcile his explanation with it (see 38, Chap. XI). He pointed out that, besides implicit vocal habits, the individual acquires implicit manual and visceral habits. In short, the organized responses to a given object of a given individual include a vast number of un verbalized responses. These, according to Watson, may serve as "conditioned substitutes" for the object, similar to the conditioned word responses. Further, in the learning process all three classes of implicit responses become geared together, so to speak, with the result that "*whenever the individual is thinking, the whole of his bodily organization is at work (implicitly)*" (38, p. 266).

ment to the course of problem solving. More specifically, he sought evidence for "postural sets" relevant to thought processes. His subjects were seated in a stabilometer chair which, unknown to them, recorded their movements while they solved problems and traced one of the Porteus mazes. In general, movement occurred most frequently *after* the problem was solved or just before the abandonment of one attack and the undertaking of a new one. Judging from these results, it would appear that the movement recorded did not represent a postural set related to the solution process so much as a release from tension. In effect, Grinstead (and Clark's results agree) showed that, whatever the nature of the mental activity in problem solving, it is not expressed in gross bodily movements.

These experiments, like many others, suggest that thinking is not necessarily associated with perceptible muscular activity. Although there remain innumerable problems in this area which have hardly been touched by psychologists, they indicate that a much more refined technique is essential. Certainly without it such experiments add up to very little convincing evidence for or against the motor theory of thinking.

JACOBSON AND MAX

Two series of experiments represent the beginnings of a more fruitful approach. The problem of increasing the sensitivity of the recording apparatus was met by employing a string galvanometer to pick up changes in electrical potential in the muscle fibers. Amplification of the currents by means of vacuum tubes makes it possible to record them photographically. By this procedure, one can study the relation between thought and muscular contraction in an enormously more refined manner than in the experiments of previous investigators (10, 23).

Jacobson (10-16, summarized in 17) chose, as a starting point, a very simple situation (10). He instructed his subjects to imagine that they were bending the right forearm and found that action currents were elicited, despite the absence of any overt movement. Further, such microscopic contractions occurred in the muscles, which would also contract in an actual movement. They did not occur in these muscles when (1) the subject was told to relax, (2) the subject was asked to imagine performing acts with other parts, or (3) the subject actually bent, slightly, the left foot or the left arm. The action current records obtained in imagining and actual movement situations were identical. On this latter point, Jacobson later obtained evidence on the relation between overt and implicit speech (16), which led him to conclude that action currents "occur in at least some of the muscles which participate when the same words or numbers are actually whispered or uttered aloud." These data throw

of the eyes, lips, and other muscles, which she links with the "changing content of consciousness." Most of this movement appeared to cease immediately following presentation of the problem and just preceding the termination of thinking. With respect to subvocal activity, she found that many, at least, of the verbal elements in the thought process are actually accompanied by minute movements of the larynx and tongue. On the other hand, she could not detect such movements for all of the seemingly verbal elements and hence concluded that inner speech alone could not account for all thought.

Thorson (33), after surveying the subject, pointed out three weaknesses of previous experimental studies: (1) the apparatus had been too crude, (2) there were gross weaknesses of interpretation (e.g., it is not necessarily true that all tongue movements are evidence of subvocal speech), and (3) the results might have been affected by uncontrolled factors such as suggestibility, discomfort of the apparatus, etc. She, herself, attempted to study tongue movements and their significance and relationship to internal speech. The subjects repeated to themselves, i.e., in internal speech, both meaningful and nonsense material, and the resulting movements were compared with those made in overt speech. Her apparatus—a small suction cup attached to the tongue, with movements transmitted by a fine wire to a kymograph—is certainly not free from her own criticism. Like Clark, she did not find that movements of the tongue are invariably present in internal speech or "verbal thought"; when they did occur, they were seldom identical with the corresponding movements of overt speech. She attempted to discover whether other "overt" language mechanisms were functioning when tongue movements were absent and concluded that they were not. However, her evidence appears to be inadequate on this point.¹⁴ It cannot be said, therefore, that the internal speech was *not* dependent upon *some* muscular movement, for example, implicit movements of the lips, chest, etc. In general, Thorson's experiment suggests that, if thinking is regulated through kinesthetic channels, the sensorimotor relations may be different from those associated with corresponding overt behavior. Thus in Thorson's case it appears that saying and thinking the same words are not accompanied by identical muscular movements. Such a conclusion does not seem to disprove the motor theory of thinking. As will appear below, it is perfectly compatible with it.

Approaching the problem in a more general way, Grinstead (8) followed up the experiment of Clark by attempting to relate bodily move-

"She had her subjects tap and sing "ah" while they were performing mental tasks, thus supposedly eliminating the muscles of the fingers (gesture) and the larynx. This procedure does not appear to rule out all the language mechanisms

in abstract thought, manual action currents were elicited far more often in the deaf and the average amplitude was much greater

2 *Sleep versus Waking* During the transition from waking to sleep, there was a progressive diminution of action currents from the peripheral musculature, in both the deaf and hearing. Sleep resulted in total absence of action currents in only a small number of cases. External stimuli applied during sleep tended to elicit action currents in the peripheral musculature of the deaf. During awakening there was a gradual increase in the action currents.

3 *Abstract Thinking* When subjects were given problems to solve of the sort in standard intelligence tests action currents from the arms of the deaf were much larger and more frequent than from the arms of hearing control subjects. The action currents varied with the nature of the task. Thus simple reading and mental repetition were accompanied by smaller and less frequent potentials than were more complex processes. However, when subjects were asked to imagine tasks involving manual response, there was little difference between the two groups, as would be expected (cf. Jacobson).

4 *Vocalized Speech* When the deaf gave what are to them 'vocal responses, such as nodding the head, action currents occurred in their hand and arm muscles, whereas few occurred in those muscles of the hearing under similar circumstances'¹⁶

In view of all these indications, despite some doubts Max concluded tentatively 'that these manual responses in the deaf are more than adventitious effects of irradiated tensions (though the existence of the tension factor is not gainsaid), and that such responses have some specific connection with the thinking process itself' (25).

In a later experiment, Shaw (32) confirmed the results obtained by Jacobson and Max. He found that action potentials accompany imaginal weight lifting. The potentials during imagery, like those during actual lifting, increased in a linear fashion with increased magnitude of the weight. The more vivid the imagery, too, the greater were the potentials.

A VIEWPOINT

There is an impressive weight of evidence in favor of the motor theory of thinking. It must be admitted that it offers an extremely convincing explanation of the mechanism of thinking. It signifies, quite literally, that thinking consists in the reactivation of past experience by means of the implicit activities of the muscles originally involved in that experience,

*It would be interesting to repeat this experiment but to see if there are action currents in such responses in the vocal musculature of hearing subjects.

doubt on Thorson's conclusions and suggest, as pointed out above, that her investigation was not extensive or sensitive enough

Other experiments continued to make the case stronger. They showed that the records for these implicit movements associated with thought differed from extraneous reflex movements (12). The finding that imagination and relaxation of the muscles concerned cannot occur simultaneously was equally significant (11-13). Even more strongly indicative that the implicit movement is essential to the thought process was the finding that amputation of a limb makes imagination or recollection of acts involving that part disappear (15). This experiment suggested that other localities served as substitutes for the lost part.¹⁵ Another highly important result was that the location of the potentials differed with the nature of the thought process. Thus if the subject was asked to visualize, potentials occurred in the ocular region (12), and "when the subject has been instructed to keep his eye muscles relaxed, he reports the absence of visual imagination or recollection." In the case of a specific act, if the subject is requested to imagine that he is bending his right arm, the potentials occur in that locality, but if he is asked to imagine visually bending his right arm, the potentials occur in the ocular region (14). The latter fact points to a much wider extension of Watson's basic theory, an elaboration which he partially recognized and which is certainly a natural development of it.

The experiments of L. W. Max (22-25) were designed to subject the conclusions of Jacobson to further test. He chose 19 deaf-mutes as subjects, since, he reasoned, their language mechanism is in their fingers and hence they should furnish particularly conclusive data. He considered also that the motor hypothesis would be more clearly verified "if it were not confined to thinking, but were taken in its more comprehensive form to include other conscious phenomena as well." His experimental conditions therefore included sleeping, dreaming, awakening, and abstract thinking.

Without presenting his findings in detail, we may summarize the significant points as follows:

1 Deaf versus Hearing Subjects Action currents were elicited from the arms and hands of the deaf but not of the hearing in situations where it might be supposed that linguistic responses were involved. For instance, dreams in the former were so characterized but not in the latter, similarly,

"Only one case was studied, more experiments of this kind would be very valuable. Jacobson's interpretation, also, is not based on very convincing evidence. The hypothesis contained in it, however, is so plausible and potentially so significant that it should be followed up."

be inquired, however, whether we should not expect to find a somewhat different mechanism for so highly automatized a performance as this, as contrasted with one where some less fixed choice of neural activity occurs. Might it not be conceivable, for example, that during the learning process such a system is established that a single kinesthetic impulse could serve as a stimulus for a battery of motor impulses? Figure 6 illustrates the point. Here S represents the initial stimulus, "Begin" (it may be auditory, visual, etc.), m_1 is the first movement in the series, followed by a kinesthetic impulse, k_1 , which sets off m_2 and m_3 . Meanwhile the kinesthetic impulse, k_2 , has set off m_4 and m_5 , etc. Some of the kinesthetic impulses, e.g., k_3 and k_5 , merely pass into the nerve centers, where they are short-circuited or cut off without further effect, provided the system works smoothly.

FINAL WORD

From our brief survey of this difficult problem, it is apparent that we are still very ignorant of the mechanism whereby thinking can occur and, once started, continue

Although the tenor of our discussion has been that the central peripheral theory is more convincing than the central theory, we cannot thereby conclude that it is the correct one. The body of experimental evidence is still too small to warrant a decision. Our reason for emphasizing the central-peripheral theory rests upon the fact that it has provided *some* means of beginning an experimental attack upon the problem, whereas the central theory has led to a stalemate. There is still the possibility that the implicit responses (which cannot be doubted) are merely incidental to thinking. The conclusive test *that they precede the thought* remains to be made. It could well be that the neural systems in the brain alone, organized as a result of learning, handle the actual thinking process.

Nevertheless, the situation is not discouraging, since the prospect for fruitful research is good. There is no reason why, little by little, we should not come to understand the mechanism better. After all, scarcely twenty years have passed since Jacobson's epoch making experiments. If we are to understand the neural side of thinking, psychologists must turn their attention to the matter, in conjunction with physiologists.

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and one thought (implicit response) follows another because a sensory stimulus (kinesthetic) aroused by the previous thought (implicit response) sets off the next in the series. The selective factors which determine what will be set off would, supposedly, depend upon the nature of the original associations and upon the conditions of organization in the nerve centers. (It is obvious how little we really know about the process.) Here, at any rate, is a means whereby we can begin to account for thought without postulating "magical" processes confined to the brain.

However, a number of criticisms have been advanced against even such a preliminary explanation. Of these, two are especially significant. The first is that the implicit muscular responses which accompany thought are not essential to the thought, for instance, they may merely be an incidental overflow of energy (24, 26, 33). A more conservative statement

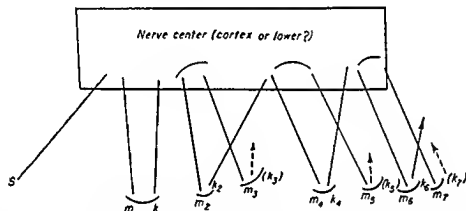


FIG. 6 A diagram suggesting how the mechanism of thinking may work in batteries at least where automatized patterns are involved

of this criticism is that, even if the implicit response is essential, it is not by any means identical with the thought.

In reply, it must be stated that, at least at present, it is impossible to prove or disprove this possibility. The experiments of Jacobson, however, suggest that, without the implicit response, thought cannot occur (especially 12, 13, 15). In any event, until the actual time relationships can be definitely established, both the theory and the criticism remain in the realm of inference. That is, if a kinesthetic impulse does, indeed, "set off" a thought process it must *precede* it.

The second criticism has been advanced by Lashley (cited by Morgan, 26, p. 549). He points out that in some activities, at least, there is absolutely insufficient time for a motor mechanism to work. For instance, in playing the piano a virtuoso may play a cadenza so rapidly that there could not be a separate sensorimotor arc—an impulse passing from the muscle into the brain and out again—for each movement involved. It may

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has been a temptation to classify mental processes as if they were strictly parallel to, or even identical with, the forms of the verbal framework. Another effect has been a tendency to become engrossed with the manner in which the words are put together, or arranged, with "propositions" as such rather than with the meanings of the words. The best way to clarify this confusion is to keep in mind that words *are* simply symbols, the product or label, so to speak, of the mental process (cf. Ogden and Richards, 16).

"LOGICAL" AND "ILLOGICAL"

Still a third confusion is that between "logical" thinking and "true" thinking. Merely to conform to the rules of logic does not guarantee that truth will result. Although no logician asserts that a conclusion is factually true if and only if the premises are valid, or that a true conclusion may not be reached from false premises, one is likely to receive the impression that "logical" and "true" are the same thing. The traditional logician frequently seems to be suggesting that you must follow the specific rules if you want to arrive at the truth. In actuality the logician means by the term "logical" *correct* according to the rules, irrespective of anything else, such as the nature of the material reasoned about, the truth or falsity of the premises, the factual truth or falsity of the conclusion, or the contribution which the process of reasoning makes or does not make to knowledge. The term "illogical" refers, similarly, to *incorrect* reasoning, which is carried out without following the rules in the proper manner. Incorrect reasoning is not the same as false reasoning, in the sense that the conclusions of such reasoning are untrue, or undesirable, etc.

It is plain, therefore, that whatever the importance or value of logic—and we shall maintain that it has value—its rules cannot guarantee truth. It is easy to become impressed with the notion that logical thinking can solve all our confusions, perplexities, doubts, and ignorance. It is undoubtedly true that efforts to deal with problems should be systematic, consistent, and efficient, and the rules of logic have appealed to people because they seem to lead in that direction. In some degree they do, but only in conjunction with the other factors in thinking, such as the cultural context, the nature of the subject matter, the personal characteristics of the individual, broad questions of value not considered in the premises, and the actual mental processes involved.

It is interesting to note, in passing, that psychologists have been strongly influenced, as have other scientists, by traditional logic (14) and have been tempted to depend upon *logicizing* to clear up their confusions and divergent theories (4, 9). Logic alone cannot achieve that end—

Chapter 6. LOGIC IN RELATION TO THE PSYCHOLOGY OF THINKING

There is another great problem in the history of the psychology of thinking which we have not yet considered. It is a problem, like so many others, which, originating in the long evolution of philosophy, confronted the psychologist when he began to pursue areas of investigation formerly dealt with only by the philosopher. This problem concerns the conditions under which thinking occurs, or should occur. In this case, the term "thinking" has been used to signify "reasoning", and the latter term in this connection refers to forms of mental processes which take place in situations where certain specified controls or forms are set up. Logic is that branch of inquiry or knowledge which concerns itself with the specification of these controls, what occurs within the resulting framework, and the outcome of that (mental or symbolic) activity. Before we consider further the contribution which logic makes to our understanding of thinking, there are several points of confusion which need to be cleared up.

In the first place, it has traditionally been implicit in logic, especially "formal logic" to equate logic with thinking. This is not to say that all logicians fail to recognize that thinking may be illogical or nonlogical but rather that, by definition logicians do not regard mental processes as thinking unless they fulfill the conditions which they have laid down. Thus the laws of logic are for them the laws of thinking. This first confusion may be clarified, perhaps, by recognizing the tacit limitations of the logician's definition of thinking and, in consequence, by keeping in mind that thinking to the psychologist includes, in addition to the phenomena of logic (valid reasoning), many other mental processes. Incidentally, it will not help much to restrict the field of logic to "reasoning," because the latter term also includes, as we shall see in the chapters to follow, activities which go beyond the conditions specified by logic.

A second confusion is that between language and thinking. The logician has frequently not been sufficiently aware that he is manipulating verbal symbols, with the result that he supposes that the words are the same as the mental process which leads to the words. One effect of this

Thus generalizations reached in one series of experiments may be used deductively to formulate a further generalization in the form of a hypothesis. Then inductive procedures may be used to collect evidence relevant to that hypothesis. That is, specimens may be collected, or samples assayed, or particular instances examined. After appropriate analysis of these data, a generalization or conclusion may be reached which either supports or rejects the originating hypothesis. But even this is too simple a picture, because at any point along the line, deduction may temporarily be introduced, nor can it be said that even during the inductive stages there is no deduction, because "already existing generalizations" may be used in collecting the data, in the acceptance and rejection of data, in the analysis and evaluation of the data, etc.

In any case, logic has endeavored to establish and explain the conditions under which the methods of deduction and induction can efficiently and dependably be carried out. Such conditions include for deduction the proper statement of propositions, the relations among them, and the conclusions to which they lead. For induction, the conditions include the factors associated with observation or measurement of facts, validity and reliability, the formulation of hypotheses, and the adequacy of evidence (1, 2, 12).

Thus the logician concerns himself with how we can most effectively present the results of thinking. The psychologist is interested in the activities and nature of the thinking itself (2, p. 18). Even the logician no longer fully believes that the conditions which he specifies represent an explanation of the nature of thinking. We shall therefore concentrate on what happens, as far as is known, when an individual behaves in situations which may be defined as within the scope of logical reasoning, and we shall try to relate these situations to everyday life.

THE SYLLOGISM

One situation in which the reasoning of formal logic takes place is called the "syllogism." It is a group of three assertions, or propositions, of which one is said to follow when the other two are granted. In a stricter sense, of course, the syllogism requires that certain conditions be met in the formulation of these assertions and their relation to each other.

An example of three assertions arranged in syllogistic form might be as follows:

All books copyrighted in the United States are in the Library of Congress

All Dr. Jones's books have been copyrighted in the United States

All Dr. Jones's books are in the Library of Congress

although it may help¹—without facts, effort, and greater flexibility of mental activity than a given logical framework permits. One aspect of the latter point has to do with some differences between formal logic and scientific method, with which we shall deal later.

Our principal concern in this chapter, however, is to bring logic into relation with the psychology of thinking. A discussion of logic itself is far beyond the scope of this book. We shall confine ourselves therefore to the points relevant to the present purpose.

FORMAL LOGIC AND SCIENTIFIC METHOD

It has become conventional to recognize two broad areas with which logic is concerned, or two kinds of situation in which the conditions for correct thinking may be specified. The first is "formal logic," that of propositions and syllogisms.² The second is "scientific method," which involves the collection of facts, formulation of hypotheses, organization of facts, and attainment of generalizations. Formal logic is sometimes said to be *deductive* and scientific method to be primarily *inductive*. "Deduction," crudely defined, is reasoning from the general to the particular or, more specifically, from stated premises to a proper conclusion, "induction," similarly, signifies reasoning from the particular to the general. It is now commonly recognized, however, that these distinctions break down in actual cases of reasoning, although deduction is often the only observable process in formal syllogistic situations. If syllogisms are extended into everyday life, so that their origins can be traced, inductive processes occur. Thus it is better to regard deduction and induction as mutually operating activities than to differentiate sharply between them (*e.g.*, as Dewey does, 3, cf. also Hull, 6, Chap. 1).

Dewey has endeavored to rid logic of such rigid distinctions. Deduction he defines as "the methods by which already existing generalizations are employed" (3, p. 419) and induction as "the methods by which generalizations are arrived at" (3, p. 419). It is evident that both kinds of method are fundamental in science (with the exception of disciplines which are deliberately kept on a deductive basis). It is possible to distinguish one from the other only at a particular point in the sequence of activities.

¹ It should be remembered that logicizing may still be very useful in the construction and criticism of scientific theory, (1) in determining the *logical* consistency of a theory—the understanding being that no theory can be *true* in so far as it involves (or entails) a contradiction and (2) in determining the logical equivalence of variously stated propositions (or hypotheses or theories).

² In our discussion, we shall be principally concerned with syllogistic forms, because psychological investigations in this area have, up to now, dealt with this kind of material. It must, however, be recognized that modern symbolic logic can no longer be characterized in so narrow a way.

situations, it is important to point out four aspects of syllogistic reasoning which limit the extent to which it may be used as a method

1 Since deduction stresses correct operations within a narrow framework, there is always the risk of sacrificing vitality and creativity. Syllogisms are easiest to formulate with reference to obvious truths and already established conclusions. This is not to say that syllogisms cannot be used creatively, in systematizing facts and in verifying conclusions, indeed, as experiments show, there are types of material, *e.g.*, involving controversial issues, in which a strict following of the rules is of considerable advantage. There is, however, a strong inclination to overemphasize the operations—to play with words—at the expense of the importance of the ideas or the contribution the conclusion may make to knowledge or use thereof.

2 Logical reasoning is not necessarily truthful reasoning. Although this condition has become a truism, it is not obvious. All that the rules of logic can do is to promote conclusions which follow validly, that is, correctly, from the premises as they are stated. If the premises are true and the reasoning valid, the conclusion will be true, but if the premises are false, the conclusion may be, but is not necessarily, false. Nor does invalid reasoning necessarily lead to false conclusions. Larrabee has given an excellent analysis of this whole matter (12, pp. 105ff). He points out that the task of the logician is "to display the exact consequences of given assumptions, irrespective of their material truth or falsity" (12, p. 107). Thus it is the duty of the person who uses deductive methods to evaluate the truth of the facts with which he is reasoning—in so far as he is concerned not only with valid inferences but also with true conclusions.

3 A limitation related to the truth of the premises is worth emphasizing, namely, the cultural values or frame of reference in which the reasoning occurs. Entire logical systems may be constructed, validly reasoned, and generally accepted as based upon true premises, and yet the entire system may depend upon a given set of values. For example, an entire economic system developed from a given set of premises accepted by everyone as true may seem to function satisfactorily, etc., but there may also be other economic systems, equally complete and satisfactory, but derived from a different set of "true" premises. Conclusions derived from neither set of premises is more true than the other, considered from the standpoint of the objective study of the management of production relations among men. Of course, one set of conclusions may be regarded as more *valuable* than the other by individuals within one culture or the other, or, conceivably, value might be measured objectively in terms of productivity, standard of living, etc. A purely logical system, however, can supply no insight into such matters.

There are certain important characteristics of such a sequence of assertions. Without going into all the details which may be found in any elementary logic textbook (e.g., 1, 2, 10, 12), the following points are relevant to the experiments presently to be reviewed.

1 The first two assertions, or propositions, are called the "premises," the third proposition is the "conclusion," which is inferred from (or—logically—is said to follow from) the premises.

2 Any proposition may be one of four kinds, depending upon whether it is affirmative or negative and universal or particular, that is, includes all of a class or some of it. In the example above, all three propositions are affirmative and also universal (designated "A propositions"). Other arrangements may be universal negatives (E), particular affirmatives (I), or particular negatives (O). An instance of an I proposition would be to state the second proposition above as, 'Some of Dr. Jones's books have been copyrighted in the United States.'

3 The manner in which AEIO propositions are arranged determines the validity of the conclusion. That is, only certain combinations yield valid (correct) conclusions, otherwise, the conclusion is invalid. If the second premise above, for example, is stated as an I proposition, the conclusion cannot be an A proposition.

4 Each proposition contains two terms, but the syllogism itself contains only three different terms. A term is "any determinate entity or group of entities which may stand at either end of any of the sorts of connection assertible by a proposition" (1, p. 165). To be valid, the terms of a syllogism must be arranged according to certain rules.

5 Since only two of the terms appear in the conclusion, they must be the two which yield a valid conclusion. The one omitted is the 'middle term' or that which brings the other two into the asserted relationship. In the example above, "books copyrighted in the United States" is the middle term since it relates Dr. Jones's books to the Library of Congress.

The syllogism therefore is a framework into which propositions may be placed to assist in the formulation of conclusions or to test the validity of conclusions. Reasoning may be carried on through the construction of syllogisms when the material reasoned about lends itself to such construction. In a situation of this kind, the rules of deductive reasoning serve the valuable purpose of guiding thought toward the attainment of conclusions.²

Before proceeding with the kinds of behavior which occur in syllogistic

² The syllogism is commonly expressed in one of three ways: in verbal or concrete terms in symbolic or abstract form or by means of diagrams. We shall be mostly concerned with the verbal form. The other two methods of stating and analyzing syllogisms, however, merit more study and use for experimental purposes.

D All Anglo-Saxons are English, all British are Anglo Saxons, therefore, (1) all British are English, (2) all English are British, (3) some British are not English

The test included items in which all three conclusions were invalid, although some of them might be factually true, as well as items with valid conclusions which might be true or false. Scores were based on the percentage of correct (valid) conclusions marked of those items attempted.

The results showed striking differences among the four types of material. The familiar data (Part *A*) were easiest, the suggestive data next (Part *D*), then symbolic (Part *B*), and the unfamiliar (Part *C*), hardest.⁴ Two interesting secondary findings were the fact that the relative standings of individual subjects changed with the different kinds of material and that the items themselves varied in relative difficulty as the material was changed. (The latter point has been investigated further in some of the experiments reported below.) Wilkins concludes that "a few items representing very common fallacies are much less difficult in symbolic material than in familiar. This is probably due to bad habits of everyday reasoning which are much in force in the familiar situation, but are not so influenced when the material is symbolic or unfamiliar."

2 *Psychological Factors* It is now recognized that the choice of conclusion inferred from a pair of premises is determined not only by the validity of the conclusion but also by various psychological influences (12, p. 103). A series of experimental studies has revealed some of them.

Woodworth and Sells (24) have analyzed the acceptance of invalid conclusions and have advanced three hypotheses to account for it. In the first place, syllogisms use the term "some" in a special sense, in everyday speech, "some" usually means "part" (only some), whereas in logic it has a distributive meaning, that is, "at least some and possibly all." For example, to say, "Some of Dr. Jones's books have been copyrighted in the United States," signifies logically that some, at least, and possibly all Dr. Jones's books have been copyrighted in the United States. This ambiguity of language sometimes occasions the choice of invalid conclusions.

A second factor is that of caution, or wariness, which may lead to the acceptance of a weak or guarded conclusion rather than a stronger, but nevertheless valid, one.

The third factor has been called the "atmosphere effect." Every syllogism seems to have a characteristic overtone, or atmosphere, arising from the way in which it is stated. Thus if the premises are stated posi-

⁴Sells (17) found that concrete (verbal) syllogisms are easier, on the average, than abstract syllogisms.

4 Finally, it may be pointed out again that thinking in everyday life includes a great many situations which are not and cannot be fitted into the syllogistic pattern. For instance, there is the realm of dreams and fantasy, of creative thought, of attitudes and opinions, and many problem-solving situations. Thus the situations of formal logic represent only a part of thinking and should not be confused with the whole.

EXPERIMENTAL STUDIES OF SYLLOGISTIC REASONING

Psychologists have not studied the syllogistic situation sufficiently as yet for us to understand thoroughly the psychological processes involved. The experiments so far reported appear to fall into two categories, (1) those concerned primarily with the nature of the data reasoned about, and (2) those concerned with the psychological factors determining choice of conclusion.

1 *The Data Reasoned About* As a result of past experience, the individual becomes familiar with some kinds of problems rather than with others, and with material presented in certain particular ways rather than in others. These factors may roughly be grouped under the head of *habits of mind*. Although this aspect of thinking will be considered later in some detail (in relation to problem solving and attitudes, for example), relatively little information is specifically relevant to deductive situations. In general, data presented in customary forms are handled more easily (at least lead to more correct answers) than data presented in changed or less familiar forms. (20) This problem has been attacked experimentally with formal syllogistic material by Wilkins. (23) She prepared a syllogism test made up of 20 syllogisms in four different forms. Part A utilized *familiar* material, with conclusions stating facts not actually within the subject's experience, Part B *symbolic* material, Part C *unfamiliar* material (either scientific or made up terms), and Part D *suggestive* material (*i.e.*, familiar, with conclusions stating facts within the experience of the subjects). There was a choice of three conclusions for each syllogism. Examples of the syllogisms follow.

A All the people living on this farm are related to the Joneses, these old men live on this farm, therefore, (1) these old men are related to the Joneses, (2) all the people related to the Joneses are these old men, (3) some people related to the Joneses are not these old men.

B All X's are Y's, all Z's are X's, therefore, (1) all Z's are Y's, (2) all Y's are Z's, (3) some Y's are not Z's.

C All *lysimachion* is *epilobium*, all *adenocaulon* is *lysimachion*, therefore, (1) all *adenocaulon* is *epilobium*, (2) all *epilobium* is *adenocaulon*, (3) some *epilobium* is not *adenocaulon*.

obtained judgments of true and untrue for each conclusion. The results show that more errors are made for emotional items than for those neutral in content. The order also makes a difference, because the presentation first of emotional items reduces the incidence of correct judgments for neutral items, the prior occurrence of neutral items increases the correct judgments of emotional material. Another suggestive finding was that little relationship exists between ability to reason accurately in nonemotional and in emotional situations, although first presenting impersonal items seems to increase correctness in both situations. These results have important implications for the logic of everyday life. They suggest that, where controversy is involved, correct reasoning is more likely to occur if the situation is first structured in some impersonal manner, or if different problems of an impersonal sort are introduced before the controversial issues are discussed.

Two other factors have been investigated in syllogistic reasoning. Age has been found to be of little or no importance (17). Intelligence was found by Willans (23) to be positively correlated with scores on her syllogism test, with the relationship highest for symbolic material. This was confirmed by Sells (17) who showed in addition, that, when intelligence is partialled out, abstract and concrete syllogisms have a factor in common, apart from intelligence.

AREAS FOR FUTURE RESEARCH WITH SYLLOGISTIC REASONING

In surveying this handful of experiments, one is left with the impression that they constitute merely a start toward the psychological understanding of deductive reasoning. Hence it is worth while to consider briefly some questions which deserve further research.

In the first place, these experiments have dealt with situations structured in strictly formal logical terms, that is, the categorical syllogism. There are other deductive situations which should be studied. For example, the "enthymeme" should be investigated. The enthymeme is a form of argument in which one premise or the conclusion is omitted *i.e.*, assumed, but not explicitly stated. Probably this occurs very frequently in everyday life, whereas the syllogism is less often met. It is apparent that many psychological variables must interplay in such a situation. Another, more complicated, logical situation is that known as a "sorites." This is an argument in which a series of propositions is stated, with each successive pair containing a common term, the conclusion links the first and last propositions. Here, again is a situation which probably occurs frequently in everyday life and which merits study.

Another possibility for research is the relation between the formal syllogism and everyday life. What is the incidence of deduction (and

or disagree) and valid or invalid. It was thus possible to analyze, in terms of the acceptance of invalid argumentation and the rejection of valid argument, errors made on conclusions with which the subject agreed and on conclusions with which he disagreed. They found that, when the subjects agreed with the conclusion, they significantly more often accepted invalid argument than they rejected valid argument; when the subjects disagreed with the conclusion, they more often rejected valid argument than they accepted invalid argument. These results indicate that attitudes towards the conclusions themselves influence the kind of argument which will be accepted or rejected.

Two later studies have gone farther into the personal characteristics which influence the course of reasoning. Morgan and Morton (15) investigated the effects of personal convictions. They used syllogism tests, each item of which had five alternative conclusions, the same for each syllogism except for changes in the words. Two situations were compared, (A) where personal convictions are not involved and (B) where the syllogisms are formulated in terms of controversial issues. The results are summarized in Table 2.

TABLE 2 RELATIVE EFFECTS OF VARIOUS FACTORS IN DETERMINING CHOICE OF CONCLUSION*
(In per cent)

Factor	Situation		
	A Neutral		B Controversial
	Letter symbols	Words	
Atmosphere	44	46	26
Logic .	27	33	20
Personal convictions	36
Other (unknown or chance)	30	21	18

* From Morgan and Morton (15).

From these results, it may plainly be seen how relatively little logic may influence thinking in an ordinary syllogistic situation. If there is comparatively little personal involvement, atmosphere effects strongly affect the course of reasoning; if, however, personal convictions are involved, it is these which have the strongest effect.

Another experiment bearing on this matter is that of Lefford (13), who compared the incidence of valid and invalid judgments for emotionally toned syllogisms with those for non-emotionally toned items. He also

obtained judgments of true and untrue for each conclusion. The results show that more errors are made for emotional items than for those neutral in content. The order also makes a difference, because the presentation first of emotional items reduces the incidence of correct judgments for neutral items, the prior occurrence of neutral items increases the correct judgments of emotional material. Another suggestive finding was that little relationship exists between ability to reason accurately in nonemotional and in emotional situations, although first presenting impersonal items seems to increase correctness in both situations. These results have important implications for the logic of everyday life. They suggest that, where controversy is involved, correct reasoning is more likely to occur if the situation is first structured in some impersonal manner, or if different problems of an impersonal sort are introduced before the controversial issues are discussed.

Two other factors have been investigated in syllogistic reasoning. Age has been found to be of little or no importance (17). Intelligence was found by Wilkins (23) to be positively correlated with scores on her syllogism test, with the relationship highest for symbolic material. This was confirmed by Sells (17) who showed, in addition, that, when intelligence is partialled out, abstract and concrete syllogisms have a factor in common, apart from intelligence.

AREAS FOR FUTURE RESEARCH WITH SYLLOGISTIC REASONING

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and state conclusions, that is, to use knowledge for purposes of communication in a deductive manner. In the latter type of situation, we find ourselves reading in the newspapers or magazines arguments presented either implicitly or explicitly in deductive terms, or listening to public speeches involving deductive reasoning. In all such situations, the rules of logic are valuable in the formulation of valid arguments and in evaluating the validity of arguments with which we are confronted.

Either from the personal or public standpoint, three general types of problems may be distinguished. First, there are problems in which the facts are usually clearly ascertainable, and in which their objective use is fairly likely to occur. Here may be included common sense situations, with relatively little emotional involvement, and problems in fields of general factual knowledge. Also of this kind, as a general rule, are areas within which we, ourselves have considerable competence, even if technical knowledge is necessary. Second, there are problems occurring in areas which require some special knowledge or technical facts, even if these are presented in a neutral, nonemotional context. Finally, there are innumerable deductive situations which occur in areas of emotional impact or of controversial issues. It is probably in this third type of situation that everyday deduction is most subject to error, either of validity or of truth.

To make somewhat clearer the relation of deduction to these three kinds of everyday situation, some examples may be pertinent. For convenience, we may designate these three types of situation as (1) common-sense competence, (2) technical, and (3) emotional. The following examples are stated in everyday language, rather than in explicit quantified form⁶.

1 Common-sense competence

a Straightforward syllogism

I observe that the leaves of a young tree I have recently planted appear to have been chewed by insects.

Premise The destruction of these insects will save the tree.

Premise Insecticide X will destroy these insects.

Conclusion Insecticide X will save the tree.

b Enthymeme

Premise All goods in the Fancy drugstore are available at reduced prices.

Conclusion Shampoo in the Fancy drugstore is available at reduced prices.

I am walking along the street and wish to use a telephone.

⁶The lack of explicit quantification is often a source of error.

various forms thereof) in routine thinking? To what extent does an individual employ deductive devices when confronted with various types of problems? How would an individual convert various reasoning problems into syllogistic form, given occasion to do so? It should be noted that the experiments so far carried out have asked for a choice of conclusion or for a judgment about a conclusion. But what happens when an individual is given only the premises and asked to supply a conclusion? Or is given a conclusion and a premise and is asked to supply another valid premise? Finally, it would be interesting to know more about the relation between deduction and induction from the psychological standpoint. Do the same factors, e.g., atmosphere, operate in induction as in deduction? Given a problem, under which conditions would inductive, more than deductive, procedures be used voluntarily? Can, or does, induction occur in a problem situation without deduction, and vice versa? These are only a few of the questions which need to be answered. Evidence bearing upon some of them is probably available from a reevaluation of the work on problem solving. In any case, more knowledge is required about reasoning situations as such, especially since they are just as frequent in everyday life as what the psychologist has called "problem solving situations." It does not yet seem to be justified to regard them as the same thing.

APPLICATIONS OF LOGIC TO EVERYDAY THINKING

Despite the fact that many questions remain to be answered in terms of concrete evidence, it is important to consider briefly the role of logic in everyday life and, in the present connection, the specific role of deduction. If we follow the lead of Dewey and regard deduction as the methods by which already existing generalizations are used, it is immediately apparent that deductive situations are widely encountered in everyday life. They are not, however, always evident as such, indeed, they most often occur in disguised or incomplete form. It is the recognition of this fact which has prompted some logicians to extend the principles of formal logic more directly and vitally into everyday life than is usually attempted (12, 21).

In general, two aspects of the problem may be distinguished.⁵ On the one hand, there are the conditions under which the individual argues with other people, and, on the other hand, there are the more or less public arguments to which the individual is exposed. In situations of the first kind, we find ourselves obliged to make assertions, develop arguments,

⁵Note also that a knowledge of logic is valuable in recognizing and dealing with the personalized factors which enter into thinking in everyday life (see Chaps. 11 and 14).

curity Council except in procedural matters or in a dispute to which it is a party

Premise The USSR is a permanent member of the Security Council of the United Nations

Conclusion The USSR is entitled to veto any decision of the Security Council except in procedural matters or in a dispute to which it is a party

b Enthymeme

Premise In accordance with the principle of freedom of the press, any political group in America should be permitted to state its viewpoint publicly

Conclusion The Communist party in America should be permitted to state its viewpoint publicly

Premise All the Republican incumbents in the City Council of Mapleton should be defeated since they have voted against every progressive measure for two years

Premise The Honorable George Smith is a Republican incumbent in the City Council of Mapleton

c Sorites

Premise Socialized medicine is a system for providing everyone, regardless of income, with adequate medical care

Premise A system for providing everyone, regardless of income with adequate medical care, is a democratic system

Premise A democratic system is in accordance with the aims and responsibilities of the United States

Conclusion Socialized medicine is in accordance with the aims and responsibilities of the United States

These examples are intended to illustrate deductive situations in everyday life. The fact to be emphasized is that such situations *do* occur and that, in consequence, formal logic is not exclusively an artificial classroom discipline.⁸ However, it is also true, probably, that deductive situations in everyday life are far more flexible and varied than those ordinarily set forth in formal logic. Although, for the sake of illustration, the above examples have been formulated in close accordance with the requirements of formal deduction, considerable effort is often necessary to make the everyday situation fit these requirements. This presents a real challenge to both the psychologist and the logician. For the former, it will be necessary to investigate the everyday occurrence of deduction, rather than confine experiments to formal categorical syllogisms. For the latter, it

⁸ See also Wertheimer's interesting discussion of the practical use of syllogistic reasoning (22)

Premise All drugstores have public telephones

Premise There is a drugstore in the next block

c Sorites[†]

Premise Life insurance is a safeguard for the future

Premise Safeguards for the future are benefits for my family

Premise Benefits for my family are good investments

Conclusion Life insurance is a good investment

2 Technical

a Straightforward syllogism

Premise Critical ratios of 2.5 or more may be regarded as indicating that there is a significant difference between two means

Premise In this memory test, the difference between the mean of the boys and the mean of the girls yields a critical ratio of 3.1

Conclusion In this memory test, the difference between the mean of the boys and the mean of the girls may be regarded as indicating that there is a significant difference between the two means

b Enthymeme

Premise In the population at large, psychological measurements are distributed in accordance with the normal distribution curve

Conclusion Reaction time to light is distributed in accordance with the normal distribution curve

Premise Valid tests are tests which correlate highly with some outside criterion

Premise This test of physical fitness correlates highly with an outside criterion (of physical fitness)

c Sorites

Premise Intelligence, as measured by psychologists, is expressed by the IQ

Premise The IQ expresses present performance on intelligence tests

Premise Present performance on intelligence tests depends upon ability to deal correctly with the test items

Premise Ability to deal correctly with the test items depends upon the nature of the items

Premise The nature of the items is related to school information

Conclusion Intelligence, as measured by psychologists, is related to school information

3 Emotional or controversial

a Straightforward syllogism

Premise Any of the permanent members of the Security Council of the United Nations is entitled to veto any decision of the Se

[†]The examples given here are Aristotelian sorites; there is also a form called the Goclenian sorites (see 2 pp 94-95 and 10 pp 370-376)

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will be necessary to promote methods of utilizing the principles of logic outside the classroom and textbook

SCIENTIFIC METHOD IN RELATION TO EVERYDAY LIFE

Although it must be kept in mind, as pointed out above, that scientific method does not exclude deductive procedures, we shall, in the present case, be mainly concerned with its inductive aspects. Reverting to Dewey's definition, then, it is worth while considering, in contrast to deductive situations, those in which generalizations are arrived at.

In its simplest terms, such a situation is a sequence of events in which observations are made (or facts are collected) and a general conclusion is drawn which summarizes the observations, or explains them, or somehow ties them together. In everyday life, therefore, observation corresponds to the acquisition of personal experience, and conclusions correspond to the resulting interpretations we make of the external world, of our relation to it, etc.

Inductive procedures are employed in scientific thinking, however, in a more complicated manner. It might be said that there must be a minimum of two inductive stages. First, there occurs sufficient observation to suggest a tentative conclusion (a question or a hypothesis). Steps are then taken to collect enough facts, or data, or observations, and to analyze those data clearly enough, to make a generalization. This second conclusion may be in the form of accepting the tentative conclusion, or of rejecting it, or of revising it, etc. The situation may be more complicated at any point in this sequence. For example, instead of one tentative conclusion there may be several alternative ones. The data may require any number of intermediate inductive analyses prior to the final formulation of a conclusion. The final conclusion itself may be merely tentative, leading to further inductive procedures, or to the deduction of sub-hypotheses which need to be tested (cf. Hull, 6), etc.

In any case, four conditions appear always to be involved, each of which is susceptible to psychological investigation as follows:

1 *Observation* This factor signifies that facts, or items of experience, or instances of phenomena begin the inductive sequence or precede the conclusion. This area is one that psychologists have already investigated extensively. They have studied sensory processes and the nature of perceptual processes.

2 *Objectivity* The collection of data or experience does not take place in a vacuum but always under conditions related to the observer and to what is observed. Therefore, the facts cannot be understood until the conditions of their occurrence and recording are specified. In everyday life it might be said that these conditions are easily ignored or indetermi-

nate, and hence the facts are usually only partially understood or not understood at all. In scientific induction, on the other hand, an effort is made to discover these conditions in so far as it is possible to do so. Once these conditions are discovered, the further effort is made to control them in such a manner that the facts are understandable. This approximation to an understanding of the conditions under which the data occur and are recorded may be called "objectivity."

There are many aspects of the objectivity condition which might be investigated experimentally. What is the effect on the acceptance of statements of linking them with alleged scientific procedure or of expressing them in quantitative terms? To what extent does prestige influence acceptance (for example, citing sources rather than merely summarizing evidence)? To what extent can the average person evaluate or recognize the objectivity of statements? Etc.

3 *Evidence* Once facts are objectively observed, the question arises as to what constitutes enough facts with reference to the particular situation in question and/or what constitutes relevant or significant facts. This condition has to do, therefore, with the adequacy of the evidence provided by the observations. On the methodological side, many techniques and evaluative tools have been devised in all fields of inquiry to deal with this principle. On the psychological side, there are perhaps two considerations subject to investigation. In the first place, the adequacy of evidence depends upon how satisfied the investigator is with his data. In the second place, and not inseparable from the investigator's satisfaction is the extent to which other people are satisfied with the data.

4 *Warranted Conclusions* The final stage of a particular inductive sequence is the statement of the conclusion, or generalization, to which the data lead. The way in which the conclusion is stated is one problem; the relation between the data and the conclusion is another; the strength with which the conclusion is accepted is a third. Of particular importance is the factor of changing one's mind. It is basic to the scientific method that a conclusion be held in doubt, or revised, or rejected if additional data be found which indicate that one of these steps is necessary. These aspects of the final stage of inductive procedures are related to deduction, and many of the problems already mentioned apply here.

All these conditions have direct relevance to everyday thinking. Everyone continually accumulates experience which he uses as evidence for drawing conclusions. The person who goes to a political rally forms judgments about the candidates and their speeches. The man walking in his garden notices the condition of the plants, on the basis of which he may decide that fertilizer is necessary. The girl who goes to a cocktail party may form judgments about the people she meets.

Although all this sounds highly matter-of-fact and obvious, the truth is that such situations involve the rudiments of scientific method. It is therefore worth considering to what extent the principles of scientific method can be utilized to render thinking of this inductive kind more efficient, productive, and correct.

THE VIEW OF THE GENERAL SEMANTICISTS

A concerted attempt has been made by the general semanticists to apply the principles of scientific method to everyday life (5, 8, 11). They have pointed out that our daily experiences involve at least three levels of reality,^a as follows (11)

- 1 The submicroscopic level, or the unseen physicochemical processes studied by science
- 2 The gross macroscopic level of objects as we perceive them
- 3 The verbal level of description, inference, etc

In carrying through the inductive stages stated above, we may be dealing with data at any of these levels or, perhaps, with several at a time without recognizing the level at which we are observing and generalizing. As we go from the lower levels to the higher, we are obliged to leave out details or facts. This constitutes a process of successively abstracting the data, or of generalizing on the basis of fewer and fewer facts. As we go thus from one level to another, it is easy to lose sight of the implied or omitted data or, in other words, not to be conscious of the abstracting process. In consequence, we readily confuse levels of abstraction in attempting to deal with reality.

Such confusions may be of lower levels of abstraction or of higher levels (5, pp 136ff). In the former case, the object as we perceive it is accepted as the real object, that of the more complete observation of science. The famous story of the blind men and the elephant is an extreme illustration of such confusions. Many experiments contribute data bearing upon this phenomenon, until it has become a psychological commonplace that the individual's conception and treatment of the world is a highly personalized affair. A particular stimulus object is perceived in keeping with the individual's own frame of reference. We shall discuss the factors involved later (see Chapters 11, 13, and 14). In reality, what happens is that the individual's perceptions provide him, ordinarily, only with partial, or actually distorted, information about the world, although he tends to act as if he had complete information about it.

In confusing higher levels of abstraction, the individual tends to treat

^a Reality, of course, may be considered in other ways also e.g., the external physical object vs the internal representation thereof

his verbal labels, or descriptions, as if they were the *essence* of the objects for which they are abstractions or think that the word really stands for or generalizes, the facts about the object or the class of objects. As Hayakawa puts it, we tend to react to the 'twentieth-second Republican we encounter in our lives as if he were identical with the abstraction 'Republican' inside our heads' (5, p. 139). In actual fact, however, the word "Republican" includes many different sorts of data, which may be derived from our acquaintance with the preceding 21 Republicans themselves, however inadequately, irrelevantly, or mistakenly they may have been observed, or from what we have read or heard about Republicans etc. Unless we are conscious of the abstracting process and thus recognize the level with which we are dealing we do not know which it may, of these data actually apply to the Republican before us.

In short, through the process of abstracting we are likely to deal with reality in a very limited and/or distorted way. At the same time, we cannot deal with reality at all except through some degree of abstraction. We usually use language as a convenient substitute for reality, without recognizing how many of the facts are represented by the words.

Hence it becomes an essential problem to make language operative as an effective medium for dealing with reality. The use of scientific method to solve problems personal or otherwise requires continual reliance upon words. The asking of clear, factual questions, the formulation of answers to questions and the evaluation and revision of beliefs and assumptions are procedures as important in everyday life as they are in the laboratory (8). They all depend heavily upon the meanings and use of words which therefore demand careful definition. We need to be aware of the processes involved in substituting words for the facts which they are designed to represent.

The general semanticists propose that the way out of these verbal pitfalls lies in the wider and proper use of scientific method in our everyday contact with reality. The ideal situation would be for the individual to go from one level of abstraction to another in the proper manner with full awareness of which level he is dealing with. In the terms set forth above, he would apply the conditions of scientific induction to arrive at and to act in terms of warranted conclusions, that is, an effort would be made to observe the facts as objectively as possible and to weigh the evidence which results. The conclusions arrived at would be utilized only in terms of the data upon which they are based.

SPEARMAN'S CONCEPTION OF THINKING

To some extent, psychologists at the present time cannot avoid explaining thinking in logical terms for reasons already mentioned. There is one theory, however, which exemplifies the logical approach very

clearly, namely, that of Spearman (18, 19) This theory appears to incorporate both deductive and inductive principles into an explanation of thinking

Thinking occurs on the basis of experience, which is acquired by means of "sentience," the process whereby the material world passes into "mind" Thinking itself, or *noesis*, manifests three qualitative principles (or processes) and five quantitative principles The three qualitative principles are as follows

1 Apprehension of experience "Any lived experience tends to evoke immediately a knowing of its characters and experimenter" (18, p. 48)

2 Education of relations "The mentally presenting of any two or more characters (simple or complex) tends to evoke immediately a knowing of relations between them" (18, p. 63) The word "education" is used rather than "judgment" because the latter implies some kind of actual comparison, whereas relations, according to Spearman, usually come to mind without any preparation, *i.e.*, the process is alleged to be essentially automatic The relations educed may be of identity, time, space, cause, valuation, etc

3 Education of correlates "The presenting of any character together with any relation tends to evoke immediately a knowing of the correlative character" (18, p. 91).

The quantitative principles are subordinate to the three qualitative principles, rather than determine the nature of the thought process, they control the conditions under which it occurs, that is, they are regarded as limiting factors These principles deal with mental energy, memory, fatigue, motivation, and individual "potencies," or capacities

Spearman's theory is fundamentally associationist, although he strives to make a case for thinking as a creative, or "noegenetic," process rather than merely a matter of the manipulation or reorganization of past experience That is, the qualitative principles signify, for example, that thought *produces* the relation between two characters rather than merely *reproduces* it The main point, however, in the present connection is that this theory implies that thinking is *inherently* a logical process, that thinking is these logically formulated principles

In reality, Spearman's theory suffers from a number of severe limitations In the first place, it is actually *descriptive* rather than explanatory As a description of certain aspects of mental processes, it may have value, but it does not seem to get us much farther than the outmoded explanations of formal logic, which it strongly resembles In the second place, the theory appears to assume what it sets out to explain That is to say, the theory attempts to account for the creative aspects of mental proc-

esses by stating that characteristics are evoked when a stimulus is presented, that relations are educed, etc. Yet all these mental processes presumably occur against the background of past experience. That is, what is allegedly "educed" could just as well have occurred before. Hence the theory cannot be proven, because the principles can only be demonstrated after the experience which might equally well explain the process has already occurred. If thinking is studied from the standpoint of the adult, *i.e.*, after there has already been a long developmental history, there is always the risk that what has resulted from development may be confused with its origins. Thus this theory seems to assume the experience which it purports to explain. As far as the author is concerned, Spearman's principles merely constitute a logical description of how experience is used in mental processes, and even this description is meaningless unless a large body of experience (associations, etc.) is assumed in advance. In the latter event, Spearman's theory becomes essentially a reformulation of associationist doctrines.

Finally, the thinking described by Spearman's theory appears to be very logical, a matter of characteristics, of relations, of correlates. The question arises as to whether thinking really is that logical or, rather, *what kind* of thinking is that logical. How do dreams, daydreams, opinions, attitudes, etc., fit into this scheme? It is probable that they *could* be fitted into it (perhaps any associationist view, logically developed could similarly be adapted), or it may be that Spearman would not regard these aspects of mental processes as thinking. If the latter, then criticisms of equating the results of training in logic with thinking apply to the principles of noegenesis.

CONCLUSION

From this discussion of logic in relation to thinking, several important points emerge. It appears that thinking in everyday life occurs in both deductive and inductive situations or, more accurately, exhibits both deductive and inductive aspects, but by no means in the very strict and formal ways specified by formal logic and scientific method. The rules of logic and the conditions of scientific method, however, can be of practical assistance in dealing with these situations. There are many problems in this area susceptible of investigation by the psychologist which have hardly, as yet, been touched, and it is to be hoped that experimental psychologists will concern themselves more with them in the future.

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Chapter 7. CONCEPT FORMATION¹

One of the most difficult aspects of the psychology of thinking is that which concerns concepts. One reason is that the formation and use of concepts bear important relationships to many other psychological problems, notably the nature and development of language, the development and functions of perception, and the phenomena of social interaction. A second reason is that concepts appear to involve complex, "higher" mental processes, which are more difficult to understand and investigate experimentally than other behavior. In speaking about concepts, we appear to be dealing with phenomena almost without parallel in the scale of life,² processes so complex and so closely associated with nervous activities inside the organism that most of our conclusions require the extensive use of inference. To the experimental psychologist, this kind of process sometimes seems too intangible for scientific study.

Still further difficulties arise from the way in which the subject has been approached historically. Since it has always been of great interest to philosophers, it has been closely bound to epistemology and formal logic. From these associations, terms like "abstraction," "generalizing," and "conceptualizing" have been acquired to describe concepts and their use. Although this terminology is still employed, as we shall see, it is necessary for the psychologist to discover the behavioral and genetic processes involved. Even at the present time, it constitutes a real problem to disentangle philosophical from psychological considerations in this area.

Finally, an obstacle to the understanding of concepts comes from the kind of data heretofore obtained in experimental attacks on the problem. The situations and tasks utilized have typically been very narrow, and the behavior observed has largely been the simple, readily quantifiable response of the subject. It will be necessary, therefore, in the ensuing discussion to point out directions in which a broader and deeper understanding can be sought.

¹ Much of the material for this chapter is taken from an article by the author (73).

² In the light of extensive investigation, it would be a mistake to regard concepts as uniquely human. Although man has evolved very much farther in this respect than lower animals, the difference is one of degree rather than kind (cf 17, 65, 72, etc.)

J PRELIMINARY CONSIDERATIONS

Before proceeding with an exposition of what is known about concepts and their formation, several additional points require clarification.

The first point has to do with the reasons for treating the subject of concept formation in this early chapter. Aside from the historical justification already mentioned, there is also a theoretical reason. As we develop the psychology of thinking further, it will become evident that we are approaching it first from what might be called the "realistic," or reasoning, side. That is to say, we are first concerned with formulating those aspects of thinking which link the organism to the world of external reality. In our view, concept formation involves processes of perception and learning by means of which the individual develops an organized and coherent relation to the external world. The consequence of these processes is the establishment of concepts, the cognitive structures which link the individual's present perceptions and learning to his previous experience. It can readily be seen why concepts should traditionally have been intimately bound up with the analysis of human reasoning.

A second point now becomes clear. We must distinguish between the processes of forming concepts and the characteristics of concepts themselves. There has been insufficient awareness of this distinction, both in theoretical discussions of the subject and in experimental studies. We need to know what happens during the learning process to explain the acquisition of concepts and also how the resulting cognitive structures function in the mental activity of the individual.

Finally, it is essential to differentiate the genetic aspects of concept formation from the problem solving aspects. This amounts, on the one hand to a study of the origins of concepts in the learning of the infant and child and, on the other hand, to an analysis of how the adult reorganizes his conceptual repertory and uses it in dealing with the external world. There is good reason to suppose that the adult does not form new concepts, in the sense that the child does, so much as he uses those he already possesses in habitual or new ways.

BASIC PROBLEMS OF CONCEPT FORMATION

We can now formulate in precise form the problems which confront the investigator of concept formation (73). They may be defined as follows:

Problem 1 Ability to Conceptualize This question may be stated explicitly in this way: How can one explain and describe the development in the child of the ability to form and use concepts?

This question phrases part of the genetic problem pointed out above.

It concerns the possibility that conceptualizing is a general intellectual function in the behavior of the individual. To answer the question, it is necessary to trace in relation to age the unfolding and elaboration of the ability to form and use concepts. At present, psychologists appear to assume that a general function of this kind does exist, along with other general intellectual abilities like memory, verbal facility, perceptual speed, etc., but it has not yet been conclusively demonstrated to be relatively independent of other functions.

Problem 2 Acquisition of Concepts, or Repertory The question here may be formulated as follows: What concepts—or patterns of concepts—characterize various stages in the development of the child's thinking and acting?

This may be regarded as an educational problem. It may be that it is inextricably bound up with Problem 1, but the two are not necessarily the same thing. In Problem 2, the emphasis is more specific than in Problem 1. The distinction may be clarified by suggesting that the acquisition of a repertory of concepts depends upon increasing experience with age, rather than upon maturation of a conceptualizing ability. Thus two persons of the same ability to conceptualize may nevertheless, at the same age, have different repertories of concepts, or children of different conceptual abilities may still acquire, generally, the same kinds of concepts at about the same age. In Problem 2, the concern is with the particular concepts which the child possesses at any age. In relation to Problem 2, it is pertinent to ascertain the order in which different concepts are acquired and their complexity and variety at various ages. Clearly, like Problem 1, this question must be approached by tracing the course of learning in the child, although investigation of these points may meaningfully be extended to adults, *i.e.*, by determining the content of adult concepts.

Problem 3 Achieving a Specific Concept We may state this question in this manner: How does the individual go about attaining a particular concept?

The answer is that an individual would be exposed to a situation where successive experiences must be organized in a conceptual fashion. The behavior of the subject would be observed and related to the stimulus conditions. The problem is evidently more atomistic than the first two, arising in a specifically defined situation rather than in the continuing development of mental organization and function.

Although this third problem is pertinent to the particular concepts achieved by the child, it has primarily been investigated at the adult level. In fact, when adult subjects are used in experiments, this problem is by far the easiest to investigate. The adult has already developed an ability

to conceptualize and has already acquired an enormous repertory of concepts. It is probable, therefore, that the adult does not typically acquire new concepts so much as he applies concepts which he already possesses, or learns new variations, hierarchies, etc., of those concepts. There is reason to suppose, in fact, that learning in the adult is different from that in the child (cf. 29).

From the statement of these three problems, it is evident that much remains to be done before an adequate theory of concept formation can be formulated. It will be part of our task to disentangle the interlocking strands of evidence on each of the problems.

✓ WHAT IS A CONCEPT?

In our efforts to answer the questions raised above, a fourth major problem area will be apparent, namely, that which pertains to the functions of concepts in the thought processes of the individual. As we have already suggested, a concept may be regarded as a kind of selective system in the mental organization of a person which links previous experience and current states with stimulus objects. Concepts are organized systems which have important structural relations with each other and which have dynamic functions in determining the ongoing course of thought. For convenience, they may be said to select and regulate the effects of external stimuli, in contrast to the systems which select and regulate responses. The latter may be called "attitudes," we shall take them up later (see Chapter 15).

Because current research indicates that concepts should be viewed in a broader, more dynamic way than has heretofore been the case, none of the conventional definitions of a concept or of concept formation is satisfactory (cf., as examples, English, 12, and Smoke, 66). One of their greatest weaknesses is the unfortunate tendency to regard words as concepts rather than to recognize that a verbal response is merely a label for the internal cognitive system, which, from the psychological standpoint, is actually the concept.

Thus, instead of attempting at the present time to offer a self-contained definition of a concept, it is preferable simply to suggest the characteristics which should be taken into account. They may be summarized as follows:

✓ 1 Concepts are not direct sensory data but something resulting from the elaboration, combination, etc., thereof. This condition is easy to demonstrate experimentally by establishing a situation in which the subject cannot respond in a specified manner without data derived from previous sensory processes.

2 A corollary of the first property, therefore, is that concepts depend upon the previous experience of the organism.

✓ 3. Concepts are systems within the mental organization which tie together, or link, or combine discrete sensory experiences. This condition may be demonstrated by proving that an individual responds to different stimuli in the same way.

✓ 4. It may be inferred that such ties or links are symbolic in nature, that is, the same concept may be invoked by a variety of stimuli. In the human organism, words usually fulfill this symbolic function, a word ties together different experiences with the same object, experiences with different objects somehow related to each other, the emotional processes aroused in these experiences, etc. e.g. *whenever* . . .

✓ 5. On the side of the internal processes of the organism, concepts represent selective factors. An external stimulus arouses a symbolic response, on the one hand, or a symbolic response guides perceptual activity, whichever comes first. For example, a creature running along a road may evoke the system for which "dog" is a name, or a boy scout may go out on a search for "birds." In experiments on concept formation, both kinds of selective system are clearly revealed. Thus an experimenter may present a whole series of objects or a group of objects simultaneously and ask the subject to classify them, or he may instruct the subject to find all the round objects.

In addition to these five general characteristics of concepts, which are more or less clearly recognized by investigators, a number of other properties have been identified pertaining to the organization of concept systems in the mental structure of the individual. We need to add, then, at least three structural features of concept systems, as follows:

6. Concepts, as pointed out by Hayakawa (27),³ have both "extensional," or denotative, and "intensional," or connotative meanings. The extensional meaning is "something that *cannot be expressed in words* because it is that which words stand for" (27, p. 61). The intensional meaning is "that which is *suggested* (connoted) inside one's head" (27, p. 62). In order to make effective use of this important distinction, it is necessary for the psychologist to modify somewhat the way in which these terms are used by the semanticist. For our purposes, therefore, the extensional aspect of concepts may be regarded as that part of the concept system corresponding to the objective properties of the stimulus object, in so far as they can be identified by the perceiver. The intensional aspect corresponds to that part of the system which derives from the individual's unique experiences with the stimulus object and the ramifying relationships which the concept system has with other systems. In a rough way, therefore, the extensional aspects of concept systems aroused in different people by the same stimulus would be similar, because objects have certain properties perceived similarly by most people, whereas the inten-

³ See also Wright (87).

sional aspects would be similar only to the degree that different people have had similar experiences with the same object and all other objects to which it is related. In any event, it is important to emphasize the fact that both extensional and intensional data are involved in concepts and that a particular concept system can only be defined adequately when both aspects are taken into account. It is especially dangerous to equate words with concepts, because one cannot be sure to what extent one kind of data rather than the other is involved.⁴

7 Concepts vary in the "consistency," or correctness, of their organization. The experiments of Reed (58-61) reveal this characteristic. His subjects were required to learn, by the anticipation method, the names of cards. Each card contained a series of four words, one of which fell into a category symbolized by a nonsense name. Under these conditions, Reed discovered that two kinds of concept might be formed. A "consistent" (correct) concept was one achieved by classifying the words into groups and then attaching to the group a nonsense syllable which worked, *i.e.*, made it possible to identify the card. On the other hand, an "inconsistent" (incorrect) concept was one achieved by attaching a nonsense syllable to some group of unrelated words, such as the first word in each group. Both achievements must be regarded as concept formation, regardless of how "objectively correct" the concept may be judged.

Although this distinction is based upon a fairly narrow experimental situation, it warrants further development. Whatever the relationship between inconsistent and intensional aspects of concepts, the two characteristics are not the same. Thus Reed's experiments show that an inconsistent concept may nevertheless have an extensional meaning (the subject can use it to name a card correctly). Furthermore, it is quite likely that, in everyday life, concepts are never completely consistent but have their inconsistent components resulting from accidental groupings of objects, inaccurate perceptions, etc.

8 Concepts have both "horizontal" and "vertical" organization. This property has been outlined by Welch (78, 80, 81). The same object, or relation, has different points of reference, depending upon the other objects with which it is compared. Horizontally, objects may be classified into different categories, all of them equally inclusive. At the same time, objects may also be classified into groups of varying com-

⁴ Although we shall not elaborate the point here, it should be noted that concept systems, as we understand them, have unconscious components. These may be regarded as one aspect of intensional meaning, they may further be regarded as a function of the relations among concept systems. Hebb, for example, gives a clue (29, p. 132).

plexity, or into more and more inclusive categories. In a given situation, the horizontal classifications are less fixed and more dynamic than the vertical. Nevertheless, even the vertical levels may be differently defined in different situations.

For purposes of clarifying these last three characteristics of concepts, let us use an illustration. Figure 7 shows a collection of stimuli. If someone were asked to select those that belong together, he would have several alternatives. Let us say that he is asked to point to the curved figures and responds by touching A-1, B-2, and B-3. This response corresponds to the *extensional* aspect of the concept. Suppose that he comments, "I dislike round objects because they're so indefinite in shape." This behavior corresponds to the *intensional* aspect of concepts.

A concept of curvedness which resulted in the selection of A-1, B-2, and B-3 would be *consistent*, whereas one which resulted in the selection of A-1, A-2, and A-3 would be *inconsistent*.

In Figure 7, horizontal concepts would be those which resulted in the selection of A-1, B-2, and B-3, of A-2, C-1, and C-3, and of A-3, B-1, and C-2 as three classes of objects, another horizontal arrangement would be the choice of A-1, B-3, and C-2, of A-3, B-1, and B-2, and of C-1, A-2, and C-3.

A vertical arrangement might be as follows:

First hierarchy: Each figure as distinct from each other figure, *i.e.*, A-1 is a filled circle, B-1 is an empty triangle, etc.

Second hierarchy: Group X, A-1, B-2, B-3, group Y, A-3, B-1, C-2, group Z, A-2, C-1, C-3.

Third hierarchy: Group O, A-1, A-3, B-1, B-2, B-3, C-2, group OO, A-2, C-1, C-3.

Fourth hierarchy: All the figures taken as a complex group, *i.e.*, they are all plane figures.

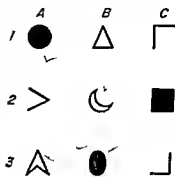


Fig. 7. A collection of stimuli which might be used in an experiment on concept formation.

THEORIES OF CONCEPT FORMATION ✓

Efforts to explain the processes whereby concepts are attained have usually been formulated in logical terms. Thus the activities of induction and deduction discussed in the last chapter, are often invoked. Although some psychologists might choose to link concept formation to

*Note that various horizontal classifications are possible at each hierarchical level.

one or the other, it is more fruitful to recognize that both are involved, although one sometimes predominates, depending upon the conditions. Indeed, as will be shown subsequently, experiments demonstrate that the two processes interplay, at least in adults, both in the acquisition of a single concept and in the use of concepts to solve problems.

So far, we have not introduced two additional terms which are usually employed in explaining concept formation. These are "abstraction" and "generalization." They are terms related to the characteristics which have already been indicated. Abstraction signifies the linking of one sensory experience to another, during which some details are left out and others become dominant (in this sense, the concept is a symbolic response for these dominant details). Generalization signifies that the dominant detail (or group of details) resulting from abstraction is used as a basis for responding similarly to the separate objects linked by abstraction and for responding to other objects similarly linked.⁶

As suggested above with reference to induction and deduction, abstraction and generalization are often difficult to distinguish in the actual behavior of the organism. They can be defined in some such terms as have been used here, but whether they are mutually exclusive processes is another matter. For example, the question may be asked as to whether concepts result only from the activity of successively abstracting "common elements" in a series of stimulus patterns, or whether concepts are formed by setting up a generalization or hypothesis, and then confirming or disproving it by examination of stimulus patterns. The experiments presently to be reviewed reveal both types of behavior, the safest conclusion is that they are not mutually exclusive activities but that either or both may occur, depending upon the conditions and the individual. Part of the confusion on this point results from the failure to recognize the three problems stated at the beginning of this chapter. In the investigation of adults it cannot be assumed that the subject is really acquiring a "new" concept, because he is probably learning to apply concepts (or aspects of concepts) already in his possession in some unusual or systematic fashion. In this situation, the subject is solving a problem rather than learning a concept, in contrast to a small child who is more likely to be learning something new. In this sense, both abstraction and generalization are far more conscious, controlled, motivated activities for the adult than they seem to be in the child. Hence for the adult, the distinction between abstraction and generalization breaks down. One cannot say that, for the adult, the sequence is perception-abstraction-

⁶ It should be noted that this is only one way of defining generalization. Another meaning will appear in the next chapter, on transfer of training.

generalization, except from the logical standpoint. In a child confronted with an entirely new realm of experience, on the other hand, such a sequence appears to be more likely.

At the present stage of our knowledge, it is advisable always to keep in mind the experimental conditions under which data relative to concept formation have been obtained. The reason is that concept formation in the adult has been said to be what has actually been clearly defined only a priori and observed only under laboratory conditions. Before taking up the theories and methods which have resulted, perhaps it is well to consider briefly the everyday functions of concepts, as yet hardly studied objectively in the laboratory.

As selective factors, representing linkages among objects, concepts are nodal points in the organization of experience. In this sense, any kind of linkage among objects or events may be regarded as at least potentially conceptual, even though it is "illogical".¹ Therefore, once the requisite organic conditions have been achieved in the course of evolution, the only additional requirements are the accumulation and organization of experience. In the case of man, there is another condition with enormous implications for the elaboration of conceptual functions, namely, language, which makes possible an efficient symbolic system and the well-nigh unlimited communication of symbols from one organism to another. The development of concepts is first of all an accumulation of experience, with some kind of resulting organization, and secondly the labeling, and manipulation, and application of aspects of this organization by means of symbols. This entire process takes place in, and is shaped by, the social, cultural, and educational context, which will be discussed in Chapters 13 and 14.

The net effect of this process is that the individual can make efficient use of past experience in at least the following ways:

1 Identification and Classification of Objects Concepts at the lowest level represent generalized categories of objects. For example, a concept of "cat" refers to no particular cat but constitutes a general cat in terms of which never-before-seen cats can be identified or recognized. This means that the individual is not continually confronted with totally new experiences requiring new responses. At higher levels, recognition may be more complex, thus "animal" refers to no particular animal, but both cats and dogs may be identified as animals. At any level, it should be understood, the object is identified and classified in terms of both extensional and intensional meanings. In the example just given, the general cat is a rather small, furry animal with a long tail, rounded paws, pointed

¹ Cf. the inconsistent concepts of Reed (58-61), discussed above.

ears, etc., but it is also to one person a purring, playful, soft, and agreeable companion, whereas to another person it is a sinister, slinking, uncontrollable, and hateful eater of helpless birds

2 *Symbolic Manipulation* The organization of experience involves more than the integration of sense impressions against the background of which recognition occurs, but comes to be represented by symbolic responses which may occur without the physical presence of external objects. The predominant modes of symbolic response in man are words, gestures, and images, probably not distinct from each other, although words have come to be the most common means of symbolizing, at least in external representation of experience. Through symbolic responses, concepts may be given names, and in this way concepts can be manipulated in many complex ways. Putting it another way, the concept can be detached from specific instances by means of a word and used to organize experience over and beyond the more simple recognition function.

The considerations just presented lead directly into the two most clearly stated theories of concept formation.

1 *Composite-photograph Theory* The primary emphasis in one theory is on abstraction. As Woodworth states it, "the features common to a class of objects summate their impressions on the observer, who, thus, gradually acquires a picture in which the common features stand out strongly while the variable characteristics are washed out" (86, p. 801).

This view, in some form, appears to have predominated among psychologists who have written on the subject. It has been explicitly stated by Moore (47), Fisher (14), Hull (41), Kuo (42), and Stevanović (69) and is at least implicit in the interpretations of Thorndike (70) and others. The "spectator" behavior described by Heidbreder (30) belongs in the same category.

Smoke (66, 68) has criticized this theory on the grounds that the term "common features (or elements)" is misleading. He suggests that it is not specific components common to a series of stimulus patterns which summate in the concept, but relationships among them. However, he appears to be in substantial agreement with the theory.

2 *Active search Theory* By contrast, another theory emphasizes generalization rather than abstraction. Here, as Woodworth states it, "The concept is supposed to originate as a hypothesis, which O proceeds to test by trying it on fresh specimens of the class" (86, p. 801). This second view therefore assigns to the individual a more active, deliberate role than the first theory. It seeks to make of concept formation a more orderly, controlled activity than does the other view.

This theory has seldom, if ever, been advanced as the sole explanation of concept formation, partly, perhaps, because of the strength of the earlier theory, which has such apparently great logical consistency and sanction. Perhaps of more significance than the condition of beginning with a hypothesis is the factor of active search. Many experiments have shown that, at least in the adult, concept formation may be the result of controlled and effortful search (especially in relation to Problem 3, presented above). Thus English (11) found that some of his subjects, in the process of abstraction, began with a deliberate intention to analyze. Heidebreder (30) observed in "participant behavior" that the subject was responding with conscious and definite effort. Smoke (66) stresses the active processes of concept formation, and Reed's experiments (58, 59) similarly show the influence of set and effort.

It is better to draw these two theories together than to make a choice between them. The discussion so far has, in fact, prepared the way to show that both theories take into account important aspects of the total process. Under some conditions, the individual may be essentially a passive recipient of sensory impressions which gradually summate into the concept. Under other conditions, it may be that an individual proceeds by establishing a hypothesis and then deliberately checking it against instances. More than likely, as has been pointed out before, these are mutually complementary approaches to a situation. This conclusion is especially warranted with respect to concept formation in adults (cf Problem 3). A qualification may, however, be necessary with respect to the genetic aspects of concept formation (Problems 1 and 2). It is possible that much of the acquisition of experience out of which concepts emerge is of the "composite-photograph" variety.

Heidebreder's findings with respect to a complex concept-formation situation (30) bear out the view that processes of both kinds operate at the adult level. She shows that concept formation involves, on the one hand, 'analysis' and, on the other hand, 'synthesis'. The subject seeks and obtains information about the situation and also organizes his activities with relation to it. 'Participant behavior' and "spectator behavior,"* do not occur as mutually exclusive methods of approach, although one or the other may at times predominate. They both contribute to the end result, the formation of a concept.

METHODS OF INVESTIGATION ~

With this background, then let us consider the ways in which psychologists have attempted to subject the processes of concept formation to scientific observation. Despite the fact that many ingenious ex-

*Where the subject adopts a relatively passive recipient role.

periments have been conducted, only a few basic methods have been employed. An adequate understanding of the preceding sections, however, should point the way to other methods, as yet largely untried in relation to concept formation.

Two principal methods have been developed for use with children, and three with adults. It is often difficult to pigeonhole experimental procedures, and a certain amount of oversimplification is bound to result. Since many investigators have used variations or combinations of the methods to be described, our classification is somewhat arbitrary.

Experiments with Children *The interview questionnaire method* This approach has been employed mainly to investigate Problem 2, the acquiring of a repertory of concepts. Typically, the method is one of obtaining information, through verbal inquiry, about the child's interpretation of objects and relations or about his understanding of natural, moral, causal, and other phenomena. Piaget (54-57) is the best known exponent of this method, which he calls a "clinical method." The procedure is essentially one of questioning the child in an objective manner about the phenomenon on which his views are desired. Clearly, many pitfalls exist in this approach, and great care must be taken to objectify the questions and to avoid errors in interpreting the answers. Furthermore, the conditions of rapport between child and experimenter have a vital relation to the subject's response.

Other investigators have modified the method in an effort to achieve greater objective standardization. The experimenter may conduct a controlled interview by asking each child the same questions in the same way, unlike the freer conversational fashion of Piaget, or he may use a questionnaire (3, 8, 9, 50, 63, 64). Sometimes the investigator has actually demonstrated natural phenomena and then asked the child to explain them (9, 50). This latter variation is surely worthy of wide use because it minimizes the language factor and presents the child with a definite situation in which he can participate.

The performance method Another approach has been employed primarily to investigate Problem 1, which pertains to the existence of a general conceptual ability. In the performance method, the investigator places the child in a situation which requires the learning or use of one or more concepts and observes the child's behavior. For example, a child is taught that, if he opens a box on the front of which is a triangle, he will find a piece of candy. He is then presented with two boxes, one of which is marked with a triangle, the other with a square, to see if he can discriminate between them (17, 18, 48, 75-78).

This method has distinct limitations from the standpoint of interpretation of concept formation. Even if a child responds correctly, that is,

appears to act in terms of the concept, it is difficult to be sure that the response is not a simple conditioned response. In the training series, the triangle \rightarrow candy relationship is set up, in the discrimination series, there may be no reason to suppose that anything more complicated is involved, *i.e.*, the square might simply be ignored. Care must be exercised, therefore, not to attribute greater complexity than is actually warranted to the child's mental processes. It may be suggested that the difficulty could be partially reduced by instituting adequate experimental controls, such as by varying the stimuli, and by restricting interpretation as much as possible to the observable behavior of the child. With children old enough to verbalize, introspective data might have considerable value in supplementing and clarifying the behavioral data.

Experiments with Adults *The introspective method* We have already discussed this method in Chapter 4. Its essential characteristic is that the subject is exposed to a series of stimuli and asked to analyze and report the mental processes resulting from the stimuli. The emphasis therefore is upon the acts, or processes, in the individual which are not directly accessible to others. The method, at the present time, is mainly of historical interest. Early investigations of concept formation made use of it (11, 14, 47). Thus a series of drawings may be exposed tachistoscopically, until the subject believes that he has discovered something important about the stimuli. The exposures are stopped while the subject reports his mental processes. Some other experiments, where the emphasis has been on behavioral data, have also included introspective data (*e.g.*, 30, 58-60).

It might be observed that valuable information can be obtained through introspective studies and that this method should not be too hastily abandoned. For example, studies of the intensional and inconsistent aspects of concepts might well utilize it.

The learning method Here the subject is placed in a situation which requires that he learn some clue or principle by means of which he can identify the members of a class. Typically, the conditions have resembled a memorizing experiment. Thus the subject is first taught the names (usually, nonsense syllables) of a series of stimuli, say, by the anticipation method. He is then shown a second series of stimuli, each of which has something in common with the first series, to see if he can correctly name them (30, 32, 41, 42, 58, 69).

The problem-solving method The third approach is similar to the learning method, except that the subject does not need to go through a preliminary learning period. He is usually presented with a collection of stimuli either simultaneously or successively, and asked to determine what they have in common or to classify them in some way. Thus the

subject may be told that a series of drawings are all instances of the same concept, he is to examine them and explain or define the concept (66) Another variation is to present the subject with a collection of objects, or drawings or cards and ask him to select those that belong together (2 20 23-25 38)

Other methods A number of additional approaches may be suggested They might yield fruitful results, especially in further study of the organization and use of concepts, the fourth problem stated above, rather than primarily in analysis of the processes of forming concepts

One possible procedure would be to adapt projective techniques to the investigation of concepts In relatively unstructured tasks of that kind, the subject may be expected to reveal important modes of interpreting the world and his relation to it, in short, it should be possible to infer a great deal about the concept systems which determine the subject's responses Although projective techniques are undoubtedly used to some extent in the way we have proposed much remains to be done to sharpen definition of the functions which are probed⁹ and, beyond that, to employ projective tests for objective research, rather than for purely clinical purposes An interesting lead is provided by the Most Unpleasant Concept Test of Harrower (26), although her interest is, once again, in the clinical diagnostic aspects of the responses She asked her subjects to draw the most unpleasant thing that they could think of The subject was then requested to describe the object and to give free associations to it The reaction types she defines are perhaps too simplified for the experimenter who is interested in a thorough study of concepts but they are nevertheless valuable hypotheses for further intensive research A similar procedure might be followed in exploring a wide variety of concepts such as the most pleasant concept, the biggest, the smallest, the best society etc¹⁰ The chief potential values of this method appear to lie in the uncovering of fairly extensive systems of concepts (in contrast to the logical dictionary mode of definition) and in obtaining evidence of intentional components

Other methods now used in the clinic could also be utilized in investigating concepts Free association surely has many possibilities for getting at the texture and structure of concepts For example, it would be very interesting to know the degree to which the same pattern of associations is produced in successive sessions Thus if we ask a subject on successive days to tell us all he knows about an apple (or pants), it might be pos-

⁹For instance to differentiate between motivational conceptual trait and attitudinal systems (cf Chap 15) For a discussion of projective tests in general see Chap 10

¹⁰There is no necessary reason that superlatives should always be used

sible to obtain a great deal of information about systems of extensional and intensional meanings, as well as about the dynamics of concepts

Still another source of methods may be sought in a different direction, namely, in the observational procedures currently being developed in social psychology. In this area, the concepts which influence interpersonal relations, role and position in the group, and, in general, the interpretation of social stimuli could usefully be investigated. No doubt there is already a great deal of data on these points, but the procedures need to be explicitly oriented to the systematic study of concepts¹¹

THE CONCEPTS OF CHILDREN

Having reviewed the techniques most commonly used in research on concept formation, we are now ready to survey the results of available experiments. As previously noted, the basic problems have not been clearly differentiated. In consequence, it is often difficult to see what the investigator is attempting to discover—if he is interested in conceptualizing as a general ability (Problem 1), or in the question of whether and how the child's store of concepts undergoes development (Problem 2), or merely in the processes whereby a particular concept is attained (Problem 3), or in the characteristics and content of concept systems, as such (Problem 4)

One way in which we shall try to bring the data into coherent relation to these problems will be to separate the studies dealing with children from those employing adult subjects. In regard to children, one extensive group of experiments has been concerned principally with discovering the general characteristics of children's concepts, whereas another group has been directed mainly toward isolating the conditions which influence the formation of concepts.

1 Characteristics of Children's Concepts Piaget's research (54-56) focused psychological interest on this area, and many subsequent experiments have ensued from it. As we have already mentioned, Piaget used an interview procedure to find out how the child conceives of himself and of phenomena in the natural world.

According to Piaget, the child's thinking is characterized by realism, animism, and artificialism. By "realism," Piaget means "a spontaneous and immediate tendency to confuse the sign and the thing signified, in internal and external, and the psychical and physical" (54, p. 124). In other words, the child does not distinguish between his own experience and external reality. There are four stages in the evolution of realism, as follows (54, p. 126): (1) absolute realism, "during which no attempt is made to distinguish the instruments of thought and where objects alone

¹¹ See Chaps. 13-16 for further elaboration.

appear to exist", (2) immediate realism, "during which the instruments of thought are distinguished from the things but are situated in the things", (3) mediate realism, "during which the instruments of thought are still regarded as a kind of thing and are situated both in the body and in the surrounding air", and (4) subjectivism, or relativism, "during which the instruments of thought are situated within ourselves" In general, therefore, the child is alleged to pass from a confusion of self and world to a distinction between them For example, Piaget gives protocols relating to the notion of thought, the nature of names, and the nature of dreams The child first confuses thought with the object thought about and only much later reaches the point of recognizing the difference between the thing, or the word, and the thought With respect to names, the child passes from a stage of assuming that the names of things are in the things themselves to a stage of recognizing that names are in the voice, the head, or the thought itself Dreams are first regarded as coming from outside and remaining external, then as arising in ourselves but being external to us, and finally as being internal in origin and remaining internal

Piaget also found that children are characterized by "animism," or "the tendency to regard objects as living and endowed with will" (54, p. 170) At first, the child believes that everything active is conscious "Thus a stone may feel nothing, but if it is moved, it will feel it" (54, p. 174) In the second stage, consciousness is attributed to things that can move, such as the sun and moon, clouds, rivers, bicycles, etc In the third stage, consciousness is attributed to things that can move of their own accord Thus a distinction is drawn between movement exhibited by the object itself and that introduced by an external agent, the sun and wind are conscious, but not the bicycle Finally, consciousness is restricted to the animal world

A third general characteristic is "artificialism," "regarding things as the product of human creation rather than attributing creative activity to the things themselves" (54, p. 253) For example, the child may first explain the origin of the sun in terms of some human agency (*e g.*, it was lighted with a match) and then by intermediate stages, the child reaches the point where he recognizes that human activity has nothing to do with it

In presenting his findings with respect to many different concepts, Piaget defines the successive stages through which that particular concept passes and links them with age For example, he alleges that the four stages of animism occur, on the average, at ages 4 to 6, 6 to 7, 8 to 10 and 11 or older In the case of physical causality (55), he finds that some 17 types of explanation are advanced, falling into three main stages In

the first, to about ages 5 to 6, the child's explanations are "precausal," representing a confusion between psychological and mechanical factors. In the second, at about ages 7 to 8, children explain natural phenomena in ways which are still essentially precausal, but the magical types tend to disappear. Finally, in a third stage, which is completed at about ages 11 to 12, more rational forms become dominant.

Piaget has also investigated the development of moral and social concepts of children (57). As in previous studies he finds successive stages, typical of different ages, in the child's understanding of rules, social cooperation and moral principles. These correspond, in general, to the sequence already summarized. For example, "moral realism" is analogous to the realism in conceiving of the natural world, *i.e.*, there is confusion (or, better, failure to distinguish) between duty and one's own role in conforming to it. The child, Piaget believes, tends at this stage to regard moral principles as having an independent existence.

Thus Piaget has found in many different areas that the child's thinking is essentially different from that of the adult. He concludes that concepts in children pass from diffuse, prelogical, subjective forms to more differentiated, logical, and objective forms. A second major conclusion arising from his data is that general stages are characteristic of particular ages and that concepts of a particular kind (of "life," for example) evolve in a definite manner.

Nagy (49) obtained results similar to Piaget's in a study of children's theories of death. She collected data consisting of compositions, drawings, and discussion from 378 children. Three stages were found, as follows: (1) denial of death as a regular and final process, *i.e.*, everything, including the dead and lifeless, is considered to be alive—the animism described by Piaget (ages 3 to 5), (2) death is personified, considered a person—essentially Piaget's artificialism (ages 5 to 9), and (3) death is understood as a process and as inevitable (ages 9 and older).

Some rather serious criticisms have been made of Piaget's views. Hazlitt (28) has suggested that Piaget's claims rest upon two unwarranted assumptions, namely, (1) that thinking can be identified with ability to express ideas verbally and (2) that the content of thought is irrelevant, that is, if a child cannot understand or state a relation in regard to one subject matter, he cannot do so in regard to another. She herself conducted experiments designed to have the child behave in terms of a concept rather than merely verbalize it. She concluded that children display a grasp of relations very early and that the only limitation is lack of experience. In general, she believes that the assumption by Piaget of a qualitative difference between adult and childish thinking is not warranted.

Deutsche (9) has done a very careful study of children's concepts of causal relations, as a result of which she criticizes Piaget's classification of answers into 17 types. In the first place, she found that the definition of the types is so vague and indefinite that it is difficult to classify answers, in the second place, the types are of extremely unequal value, some being too inclusive some being extremely narrow, although Piaget tends to treat them as though all were characteristic of children's concepts, and finally, it is a matter of personal judgment as to what a child really means by his explanation.

Many criticisms brought to bear against Piaget rest upon his method, which is indeed difficult to accept fully, for example, one never knows how many subjects he is relying upon in the formulation of his conclusions and one never knows how many children were asked the same questions. Other criticisms depend in part upon Piaget's terminology, although he himself admits the fallibility of such words as "animism" and "realism."

However, a large number of studies have been carried out with more standardized procedures than those of Piaget, some of which have confirmed his results others of which have disagreed with them. Grigsby (22) investigated developmental trends in concepts of time, space, cause-part-whole relations, discordance, and number, using children between the ages of 2 years 8 months and 6 years 4 months. In each of these kinds of concept, she found gradations although these were more related to mental age than chronological age. Specifically, with respect to causal relations, she found good agreement with Piaget's 17 types.

This is in marked contrast to Deutsche (9), already mentioned whose experiment is in many ways a model of research in this field. It merits rather detailed consideration. She developed two tests, both concerned with causal relations the answers for which were written. In the first test, there were 11 demonstrations of physical phenomena which the child was asked to explain. For example, the experimenter placed a jar over a lighted candle and then asked, "Why does the candle go out?" In the second test, there were 12 questions, for example, "What makes the wind blow?" and "What makes the snow?" Deutsche used 732 subjects (thereby meeting at least one criticism of Piaget) distributed rather equally over the age range of 8 to 16, both boys and girls. They were also distributed over Grades 3 to 8 and corresponded well with the percentage of the male population of Minneapolis falling into seven occupational groups. IQs ranged between the intervals of 60-69 and 140 and above. The enormous number of answers obtained were carefully and objectively evaluated in several ways by several judges (in one instance by 13 judges, in another by 3). The following are Deutsche's major con-

clusions pertinent to the characteristics of children's concepts of causal relations

Classification of all the answers to Piaget's seventeen types of causal thinking revealed that only four types of thinking (phenomenistic, dynamic, mechanical, and logical deduction²) are found in large enough frequency to warrant further analysis

No evidence was found that children's reasoning develops by stages. Both quantified and qualitative analyses show a gradual progression in answers with advancing age, and all kinds of answers are found spread widely over the age range.

Evidence was found of specificity in children's causal thinking as opposed to a general level of thinking. The child responds to different questions with answers differing in qualitative as well as quantified value.

However, Deutsche's study itself has certain limitations. Perhaps the most important of these has to do with the nature of her questions, which were not as varied as those of Piaget. In fact the absence of some types of answer in her data might be accounted for by the difference in the kind of question which she asked. Another limitation has to do with the ages of her subjects, the youngest of whom was 8. By this age, according to Piaget, some of the pre-causal types of answer have largely disappeared. As a check on this point, Deutsche administered the tests to 13 kindergarten children (5 years old). Despite the fact that these data are not presented in the same way as those for the other subjects, they seem to agree fairly well with Piaget's formulation, that is, the younger subjects are much lower in total score, and the pre-causal types of answer appear more frequently. Nevertheless, even at the 5 year level, the same general range in type of answer is evident as at the older levels.

Russell and Dennis (63) devised a standardized procedure for investigating animism in children's concepts. It consisted of a questionnaire relating to 20 objects, some physically present, some visible outside the room, and others presented verbally. They tested 385 children ranging in age from 3 years to 15 years 6 months. Criteria were set up whereby the answers could be classified into five categories: the four stages previously formulated by Piaget and a no concept stage. This method was then used to check Piaget's contention that these categories of response

² Phenomenistic: two facts given together in perception, no relation except contiguity in time and space; dynamic: no animism, but still seeing in objects forces capable of explaining their activity and movements; mechanical: explanation by contact and transference of movement; logical deduction: explanation by the principle of sufficient reason.

are characteristic of definite ages (64) The subjects numbered 774, ranging from Grades 1 to 8 It was found that 98.5 per cent of the subjects could readily be classified into one of the stages Curves based on the data showed increasing modes with increasing mental age, from which Russell concludes that it is probable that individuals pass sequentially through the stages Nevertheless, as Deutsche had found for causal concepts, all the stages occurred at every age rather than being distinct from each other, as Piaget had described them

Dennis (8) also applied Piaget's questions to Zuñi and Navaho children He found that animism, realism, and artificialism are also typical of their concepts Bruce (3) similarly investigated the occurrence of animism in Negro, as compared to white, children She found Piaget's four stages, but she believes that the concept of "alive" is a more meaningful way to interpret children's beliefs than to refer to them as animism Like other investigators, she found that all four stages occur at all age levels

An experiment by Oakes (50) tends to agree with Deutsche His method was patterned closely after that of Piaget, and he attempted to obtain age sampling at younger ages than did Deutsche Thus he had 77 kindergarten subjects, from age 4 years 10 months to 7 years 4 months, in addition to smaller numbers of children in Grades 2, 4, and 6 He used 15 kinds of question (How were the hills made?) and 17 simple experiments, similar to those of Deutsche He found, as Deutsche did, that Piaget's 17 types of explanation are not usable, instead he classified the answers into three major categories, physical, or materialistic, non-physical, or nonmaterialistic, and failure to explain For both types of test there was a marked increase with age in the incidence of physical explanations, accompanied by a corresponding decrease in the other categories In his results, too, all types of answer were given by all the age groups, and each subject gave a wide variety of explanations Hence he found no evidence for Piaget's contention that definite stages characterize definite ages "The types of answers given by these subjects were influenced by the nature of the problem" (50, p. 93) The great majority of the answers were naturalistic, which contrasts with Piaget's emphasis on various kinds of magical, illogical, etc., explanations

Finally, it should be noted that experiments of very different kinds have also cast doubt upon Piaget's view of age stages in concept formation For example, Welch and Long (46, 80) tested children between the ages of 42 and 83 months with tasks which required the use of concepts previously learned Although the number of subjects who could pass the tests increased with age, there was no orderly progression in this respect.

From all these studies, the following conclusions may tentatively be drawn

a. Children's concepts change with increasing age, but more in the form of a gradual progression (toward greater adequacy or more informed understanding, perhaps) than of definite stages. The change does not occur at the same rate for all children. Indeed, some may never achieve the more advanced kinds of explanation at all, since even adults may display concepts similar to those of children. Further, no child at a particular age gives consistent responses of one type or another but instead may give many different types of response, depending upon the situation.

b. The apparent difference between children's concepts and those of adults is less a matter of kind than of degree. Although animism, artificialism, and realism—to retain Piaget's terms—are found relatively more often in children, these characteristics are not absent by any means from the thinking of adults. The reverse is also true, since the supposedly more advanced, more logical, more correct characteristics occur in the concepts of children. As will be shown further in the following section, it is probable that Hazlitt's observation is correct: The greatest difference between the concepts of children and those of adults is that the former lack experience and knowledge (28).

Finally, it is worth emphasizing a principle stated by Wolff (85). It is necessary, in order to understand the concepts of children, to judge from the child's standpoint, not that of the adult. What strikes the adult as "illogical" may not be so from the child's outlook, which is merely based upon less, or different, experience. ✓

2. Conditions Related to Concept Formation in Children. In this second area of research, much remains to be done, for example, relating what is known about developmental processes in other aspects of behavior specifically to concept formation. We shall here simply summarize some of the conditions which have emerged in experiments dealing with concept formation, as such.

One of these is obvious from the foregoing discussion, namely, *age*. ✓ Thus Welch and Long (46, 78, 80, 81) have shown that the conceptualizing ability of children seems to develop from simple to more complex levels. A preabstract period leads gradually to an ability to grasp first hierarchy concepts, such as that "men" and "women" are all "people." This period begins at about the twenty-sixth month and is followed, in about the middle of the fourth year, by the ability to grasp second hierarchy concepts, such as that "potatoes" are "vegetables," "apples" are "fruit," and both "vegetables" and "fruit" are "food." In turn, the child may develop an ability to grasp concepts of still higher hierarchies in later years. It should be noted, in relation to the preceding section, that, at least after the age of 8 years, children can deal with concepts at any of the lower hierarchical levels (46).

Reichard, Schneider, and Ripaport (62) have used sorting tests to study the conceptual abilities of children. They suggest that there are three levels of development, a concretistic level, where classification tends to be made on the basis of nonessential incidental features of the objects, a functional level, where classification is on the basis of use or value, etc., and a conceptual level, where the child classifies more nearly on the basis of abstract properties or relations. The concretistic performance was more typical of the youngest subjects (up to 5 or 6 years), and the functional performance, more typical of older children (up to 8 or 10 years) ¹³

Still another change in conceptualizing with age is suggested by the work of Colby and Robertson (6), who tested three age groups (3-6, 6-7, 7-9) with colored forms and retested them after one year. There was a progressive shift toward a dominance of form as the basis for classification. Welch (76, 78) reports a similar result, although he concludes that form tends to be dominant below the age of 3 years, with a shift to color between 3 and 6 and a return to form again after 6 ¹⁴

Other efforts to trace conceptualizing in relation to age have produced the following results

Triangularity and other forms (17, 18, 48) Concept can be established at 15 months to 2 years

Roundness (44) Concept established as early as age 3

Magnitude (40, 71, 75, 77, 79) Simple concepts of size can be established quite early, perhaps at the fourteenth month, but "middle-sizeness" comes later, probably not much earlier, on the average, than the third year

Contradictory relations (10) This situation is one in which children are asked to distinguish the larger of two equal ring segments so placed that one gives the illusion of being larger than the other, the larger is then placed so that it appears smaller. Recognition of the contradiction was found to appear between ages 3 and 4, at the same time as the concepts "big" and "little"

Time (1, 15, 16) Concepts in this area undergo long and continuous development. General divisions of time are grasped early, "morning" or "afternoon" by 4 years, what day it is by 5 years, the conventional time system by the sixth grade in school. Still other time concepts are grasped later, with adults about equal, on the average, to ninth- or tenth graders

¹³ See below for discussion of concrete and conceptual attitudes in adults

¹⁴ Apparently, form also tends to be dominant over color in adults, as would be expected from the above (see 35)

Cause effect relations (43) Grasped by the eighth or ninth year, but probably not before

Social concepts (52) There is a steady increase from grade to grade, although concepts in different problem areas differ Recognition of social problems is not great before the sixth or seventh grade

A second condition is *intelligence* It is probably safe to say that psychologists have assumed that *intelligence* and *concept* formation are related, although they have not yet worked out the relationship explicitly There are two assumptions, really—that one of the variables of intelligence is the ability to form and use concepts and that part, at least, of the reason that mental age increases during the period of growth is that the ability to conceptualize increases ~

These assumptions seem reasonable, and yet relatively few efforts have been made to verify them What this amounts to basically, is comparing the performance of children of high and low intelligence, estimated as best one can, in situations which involve the formation and/or use of concepts When this is done, some unexpected results have been found which force us to raise additional questions Thus Deutsche (9) found that scores on her tests of causal relations had only a low relation to intelligence test scores (Kuhlmann Anderson) The studies of Welch and Long (46), as well as others, indicate that chronological age is at least as important as mental age

A third condition is *training or experience*, which further complicates the relationship between intelligence and concept formation Here studies such as those of Deutsche (9), Oakes (50), and Ordan (52) suggest that children differ in their concepts and use of concepts as much because of variations in experience as because of variations in intelligence Investigations of very young children, such as those of Gellermann (17, 18) and Welch and Long (83), indicate that at a very early age children are capable of learning concepts and can, in fact, be taught them Peterson (53), in a study of generalizing ability involving the principle of the lever, found that grade in school had a closer relation to performance than did either age or intelligence In Deutsche's investigation (9), the correlation between school grade and scores on her concept test (combined forms) was .445 (PE .067), whereas the correlation with IQ was only .182 (PE .098)

A fourth condition is *socioeconomic status* Both Deutsche (9) and Ordan (52) report that socioeconomic status has only a very low relation to scores on concept tests

Still a fifth condition is *vocabulary* Both Deutsche (9) and Ordan (52) report a substantial relation between this factor and concept scores In

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¹⁴ Apparently, form also tends to be dominant over color in adults as would be expected from the above (see 35)

tems¹⁶ In consequence, it is probable that the main emphasis with adult subjects should be placed on the behavior of the subject, what concepts he uses, and how he uses them In the following discussion, it will be assumed that the subject is fundamentally using his past experience rather than acquiring new experience Our data relate, on the one hand, to conditions of presenting the stimuli and, on the other hand, to the behavior occurring in concept-problem situations

1 Conditions of Presentation The many excellent experiments in this field have contributed much to an understanding of efficiency in situations where concepts are to be used or experience is to be generalized

An early objective experiment, the famous one of Hull (41), was an effort to determine the factors which promote efficiency in this kind of problem solving situation

The method used by Hull has served as a prototype for many subsequent experiments He prepared 12 series of stimuli, each of which contained a common element, or concept These were presented successively in an exposure apparatus With each exposure, the experimenter pronounced the nonsense syllable which served as a name for the concept In succeeding series, the subject tried to anticipate the name of the stimulus but was corrected by the experimenter if he failed to assign the correct name to it The ingenious stimuli used for this procedure were Chinese characters built around radicals (the common element, or concept) In this way, Hull compared, for example, two *orders* of presenting instances of the concept, each of which contains a common element The first order is from simple to complex, the second from complex to simple If the time spent on each instance is the same, there is no apparent difference between the two orders "but if each individual experience in the evolution series is continued until the reaction to it is just perfected before passing to the next, there is a distinct advantage in favor of the simple-to complex method" In general, *simple instances* are more efficient, because it takes less time to form the concept from them (*i.e.*, extract the common element) Hull also studied the effect of *emphasizing the concept* (the common element) in various ways, in contrast to presenting only the total characters in which the concept is embedded Giving the common element outright is no more efficient than extracting it from a series of concrete instances In the former situation, however, the subject can better verbalize the concept, although this is obviously not necessarily a true indication of functional value, since the subject did not show any better performance If the common element is emphasized in

¹⁶ We do not mean to imply that adults cannot and do not continue to add to their repertory rather we should hypothesize that this learning is relatively of much less importance than it is in children

the former case, the correlation between number of words used and scores was .48 (PE .06), in the latter the correlations between vocabulary and various areas¹⁵ of social concepts were of about the same magnitude.

In summary, it can be seen that the genetic aspects of concept formation have been very inadequately studied. With respect to Problem 1, conceptual ability, very little is known. It is not clear, for example, whether an ability to acquire and use concepts can be meaningfully defined apart from other intellectual functions, as memory, verbal, and perceptual abilities now are, or whether it is enough simply to say that the child acquires an increasingly varied and efficient repertory of concept systems. Such a general function would have to be defined before the psychologist could proceed with further questions regarding its growth characteristics. Of particular interest here is the apparently low correlation of 'concept-test' scores with intelligence-test scores and their relatively high correlation with training and experience, of which one important component seems to be vocabulary. Whether the latter relationship depends upon chronological age or upon amount and kind of training has not been clearly worked out.

In regard to Problem 2, the acquisition of a repertory of concepts, much more is known. Research shows that children's concepts undergo long and continuous development. In addition to the readily observed increase in the number and complexity of concept systems, it is probable that they gradually change from naive, prelogical, egocentric forms to more mature, logical, objective forms.

CONCEPT FORMATION IN ADULTS

Research at the adult level has primarily been concerned with Problem 3, that is, with situations in which a particular concept or group of concepts is to be isolated from or applied to a particular set of stimuli. We shall also find many implications bearing upon the properties and use of concepts themselves (Problem 4).

It will be recalled that we distinguished between learning and problem solving situations in the study of adult concept formation. In actuality, the latter may be regarded as the more typical approach. Although it is true that experimenters have striven to devise conditions under which the subject is confronted with new experiences out of which new concepts are supposed to be evolved, it should now be apparent that the adult does not usually (if ever) learn new concepts in the same sense as the child does. Rather, the adult utilizes his repertory of concepts in new ways and in relation to new stimuli, or reorganizes the components of concept sys-

¹⁵ Crime economics government war peace etc.

them In a later study, Smoke (67) confirmed this result but felt obliged to qualify the conclusion to the effect that the presence of negative instances may serve as checks in the learning process and thus are of assistance, especially where difficult concepts are involved Buss (4) has further tested the effects of the proportion of positive and negative instances He found that the proportion of each is less significant than the kind of reinforcement, that is, the subject may learn not only what objects are true instances of the concept but also what objects are not Both results are correct If more positive (true) instances are presented in the learning series, the subject will recognize more positive instances, the opposite is true for negative instances

The experiments of Reed (58) reveal the effects of other conditions The task of the subject was to learn the nonsense names of 42 cards, on each of which were written four common words One word on each card belonged in one of six categories, represented by a nonsense syllable To study *set*, Reed instructed one group of subjects merely to learn the name of each card, a second group were to learn the name and secure the meaning and were also given information about the nature of a concept The latter group, characterized by a specific *set*, showed a greatly superior performance Reed suggests that this economy occurs because the latter group are more likely to keep the goal (learning the concepts) in mind and participate more effectively in the problem situation by searching for possibilities of grouping, by testing hypotheses, etc (cf also Ewart and Lambert, 13) In another experiment (59), Reed examined the effect of *length of series* Within the scope of his material, longer series appeared to be more efficient than short series, that is, the amount of work required, though absolutely more, is relatively less for longer series, and the proportion of consistent concepts achieved increases with length of series In testing the influence of *complexity* of stimuli (60), Reed used the same situation but increased the number of words on each card and introduced confusing categories, which applied only to a few of the total possible number of instances As might be expected, the effort required to form concepts increased directly with increased complexity The most striking effect, meriting further research, was that the proportion of consistent, or correct, concepts decreased markedly with an increase in complexity, with a corresponding increase in the proportion of inconsistent, or incorrect, concepts As Reed states it, " . . . as the complexity of the stimuli is increased there is a definite trend to shift from logical to illogical learning, or to base concepts on such factors as the primacy, and frequency, and sensory similarity of contiguous stimuli " The comparative efficiency of *serial* and *simultaneous* forms of presentation has also been studied by Reed (61) He finds that concepts are attained more

situ, by outlining it in a different color, it is easier to generalize it. As far as *familiarity* is concerned, it was found that twice as frequent exposure to half the series of instances is less efficient than moderate exposure to all the members of the series. Finally, the most efficient method of presentation was one which combined examples of the concept ("naked" common element) with concrete examples of it embedded in various contexts.

The elaborate and lengthy series of experiments performed by Heider (31-39) carries further the principles formulated by Hull. Her general procedure was also an adaptation of the familiar memory situation, where the subject learns the nonsense syllable names for various categories of stimuli by the anticipation method. She confirms the fact that concepts are attained more easily when the *critical features* (the features which identify the concept) are readily accessible perceptually and are more "thinglike" (35, 36). For example, concepts of objects were more quickly attained than concepts of forms, and concepts were attained more quickly, in general, when noncritical features only occurred once, with repeated occurrence of critical features. Concepts are also attained more easily when the context provides strong perceptual support for the critical features. In general, the more thinglike the instances, the more readily is the concept attained, and the more the context supports a particular concept, where several are possible, the more rapidly will the supported concept be attained. Thus varying the context from experiment to experiment resulted in marked changes in the order of attaining concepts (see below). Another line of evidence comes from the nature of the task. When the subject is permitted to participate perceptually more directly in the experiment, concepts are attained more readily. For example, when subjects sorted cards instead of observing the instances in the exposure apparatus, the concepts were more rapidly achieved. The use of verbal instances of the concepts instead of drawings yielded essentially similar results, except that the order of attainment seemed to depend not upon the thing character of the instance but upon "semantic efficiency."

Another condition is the effect of *positive and negative instances*. Kuo (42), using a method similar to that of Hull, found that the more negative or misleading characters there were in the series, the less accurate was the conclusion. Smoke (66) used geometrical designs as stimuli. Each series was constructed according to a certain principle, the discovery and definition of which was the subject's task. No difference in efficiency was found between series containing both positive and negative instances of the principle and series in which only positive instances appeared. Actually, the situation may be more complex, for some subjects seemed to be aided by the negative examples, whereas others did not profit from

the readiness of attainment will depend upon how accessible the critical features are to perception.

It is evident that much work remains to be done to ascertain how broadly true these conclusions are. At present, they must be regarded as tentative statements applicable to the kind of experimental situation upon which they are based.

2 *Behavior in Concept Formation* Experimental studies have revealed a number of important phenomena which occur in the formation and use of concepts. To some extent, accordingly, it is possible to describe what happens when the individual is placed in a situation corresponding to the experimental conditions.

Several of the experiments, which attempted to break down the successive phases of discovering the concept, mainly through the introspective method (5, 11, 30, 41, 59, 69), have emphasized the *gradual evolution* of the concept. In general, the subject becomes exposed to the material and little by little begins to interpret it, perhaps by perceiving in it familiar objects or associating aspects of it with his past experience, perhaps by deliberately attempting to analyze it, comparing one instance in the experimental situation with another, etc. In time, some features begin to stand out, others to "disintegrate" (69), until the subject is able to formulate a principle which will work—or, of course, he may fail to develop an adequate concept.¹⁷

Hull (41) and Smoke (66) found that an individual may be able to act in a manner showing that he has *attained the concept without awareness*. That is, he can successfully identify specimens of the class without being able to verbalize the concept.

In his analysis of consistent and inconsistent concepts, Reed (59) has formulated a number of factors responsible for their origin. In general, the development of a consistent or inconsistent concept results, not from different factors, but from different manifestations of the same factors. These factors are *set*, *identical perceptual elements* in the concept symbol and the instances, *frequency* of occurrence of key items belonging in a given class, *contiguity* between an instance and the class symbol (e.g., position factors), and *generalization*. Consistent concepts are favored by a specific set directed toward group classification, whereas inconsistent concepts are more likely to occur if the set is general rather than specific. Consistent concepts are favored by the occurrence of identical elements based on meaning or group relationships, whereas inconsistent concepts

¹⁷This phenomenon is patently analogous to those reported in studies of the genetic processes, but it remains an open question as to whether one can be inferred from the other.

rapidly with the serial method but that the difference between the two forms of presentation rapidly decreases as the amount of material increases. That is, it is relatively more difficult to attain concepts when instances are given simultaneously than when they are presented in serial fashion, if the number of instances is small, with a large number of instances, difficulty is about the same. A further point of considerable interest is that a much greater proportion of consistent concepts was attained in the simultaneous presentation, despite its lesser efficiency. Again, however, the amount of material is important, because the difference approached zero as the number of instances increased.

Gengerelli (19) has studied the effect of *mutual interference* by having one group evolve concepts from meaningless drawings which were named by a letter, and then evolve from the same material concepts named by a different letter, a control group carried out the same procedure, except that the drawings were changed somewhat in the second stage. The experimental group showed more interference than the control group, thus indicating the difficulty of shifting the meaning of a concept from one situation to another.

From this survey of experiments, it may be said that, if concept formation is defined as the process of discovering an identifying detail, relation, or principle by means of which a series, or collection, of instances can be classified, as it may be perfectly proper to do in keeping with our Problem 3, then we know to a considerable extent what will happen under various conditions of presenting the material.

The major findings are as follows:

a The order of the instances does not particularly matter, if an equal amount of time is allowed to each.

b Alternation of abstract instances with concrete examples is the most efficient method.

c. In a short series of instances, serial presentation is more efficient than simultaneous presentation but yields a smaller proportion of consistent concepts, the difference decreasing as the number of instances is extended.

d Negative instances are not necessary but may be included to serve as an occasional check on accuracy or as a means of promoting correct recognition of objects which are not true instances of the concept.

e. The subject who is well instructed in his task will do better than the subject who is simply a passive recipient of the material.

f. Consistency is promoted if the series is long rather than short, and simple rather than complex.

g A given context is likely to favor one concept over another, and

the subject. It might be argued that Heidebreder's stimuli are more natural and less distorted than those of Dattman and Israel—or the opposite might be the case. There is also some reason to suppose that Heidebreder's order of dominance has a basis in the order in which the child acquires a repertory of concepts. Adequate research could answer the question.

Another series of experiments has revealed *concrete and abstract behavior* in the attainment of concepts. In experimenting with various sorting tests, Weigl (74) found that individuals characteristically displayed contrasting concrete and "categorical," or more conceptual, approaches.²⁰ In the former case, the individual lacks to some degree the ability to classify objects according to some principle or property—his behavior is strongly determined by the characteristics of objects as perceptually given at the present moment. In the case of abstract performance, the individual can organize objects in terms of properties which they have in common. Such persons seem more easily to relate one object to another, perhaps because object characteristics are less closely inherent in, or attached to, the object. Take, for example, a collection of forks and spoons, some of them of regular size, some of them of doll size. The person who would find it difficult to place as 'belonging together' all the forks, regardless of size, would be displaying concrete behavior.

Using a variety of tests, Bolles (2) further analyzed these approaches, suggesting that concrete performance is primarily determined by sensory impressions, whereas the more conceptual, or abstract, performance is a response to objects as representatives of a class or category. The 'basis of pertinence,' or way in which objects are classified was found to be of the following types:

a Identity. Items belong together by virtue of exact sensory equivalents.

b Partial identity. Similarly determined but classification rests upon an equivalence of only one sensory attribute.

c Cofunctionality. Items belong together in some concrete situation.

d Categorical similarity. Items belong together because they represent a class, not because of similar attributes or contiguity of function.²¹

Hanfmann and Kasantin (24, 25) developed a standardized procedure for testing conceptual performance with the Vigotsky sorting test. This test consists of a collection of small blocks, varying both in color and shape. On the bottom of each block is a nonsense syllable which serves

²⁰It is interesting that English (11) reported substantially similar approaches.

²¹In this research and others below, the primary emphasis was upon the comparative conceptual performance of aments and/or dements and normal persons.

are influenced by identical elements based on perceptual (and incidental) similarities

Some rather remarkable and significant behavior was observed in Heidebreder's experiments (32-39), which has been confirmed by Wenzel and Flurry (84). In these experiments, it was quite regularly found that concepts are formulated in a definite *order of dominance*, depending upon the nature of the material, the context, etc. The subject was presented with stimuli in the form of sequences of drawings representing concrete objects, spatial forms, and numerical quantities. First learned were concepts of objects, then concepts of forms, and last concepts of number. If, however, the stimuli were varied to make some critical features more obvious than others, there was likely to be a change in the order of dominance. Thus in a series of 12 experiments involving card sorting, some conditions resulted in dominance of form, or color, or, in one case, quantity. When the form was represented by the whole card, which was also colored, and the concrete object was a small drawing on the card, the order of dominance was color, spatial form, objects. Cards containing the forms outlined in different ways, with small objects varying in number, and without color, were sorted in the order spatial forms, objects, linear quantities, and number. On the whole, however, it was rather difficult to influence the order of dominance. In 16 experiments in which it was possible to attain concepts of objects,¹⁸ these concepts were attained first 11 times, second 4 times, and last only once. Numerical quantities were attained last in 10 experiments, second in 2 experiments, and first only once (in an experiment from which objects and forms were absent).

Doubt regarding the order of dominance has been raised in an experiment by Dattman and Israel (7). They suggest that the stimuli employed by Heidebreder did not present equivalent perceptual instances for all the kinds of concepts. When these investigators tried to make the instances of concrete objects no more accessible to perception than those of spatial form and number, a definite order of attainment was not apparent.¹⁹ They conclude, therefore, that the context in which an instance is presented (its situational support) is the crucial factor, rather than a hierarchy of dominance. Further work will be required to settle the issue. For example, one needs to know the extent to which the experimental stimuli correspond to familiar conditions within the usual experience of

¹⁸ Including the experiment of Wenzel and Flurry (84).

¹⁹ Heidebreder in several experiments tried various methods of rendering the instances equivalent. Hence there is a possibility that the findings of Dattman and Israel are associated only with limited conditions. Cf. also Grant (21), whose results, with a different method, support Heidebreder.

important aspects of concept formation and use Hanfmann (23), in fact, has presented preliminary evidence based on the Vigotsky test for "personal patterns" of approach in tasks involving concepts. In the predominantly "thinking" (conceptual, or abstract) approach, the subject develops hypotheses without paying much attention to the blocks, which are utilized to check the hypotheses, all this may be accomplished without actually touching the blocks. On the other hand, in the predominantly "perceptual" (concrete) approach, the individual keeps in close touch with the material and gets his ideas from looking at or handling the blocks. A strongly marked approach of one kind or the other is characterized as a "concordant" pattern, whereas in a "discordant" pattern, the two tendencies conflict with each other, leading to a less efficient performance.

The research available on concrete and abstract aspects of thinking is not yet sufficient to define them adequately. Studies have dealt primarily with the behavior observed in the use of concepts rather than with concrete and abstract properties of concept systems. The data suggest that concrete behavior is characterized by response to separate objects as they are perceptually given (as entities), rather than to relations between objects, on the other hand, abstract behavior is marked by response to the properties of objects, apart from the immediately given perceptual situation, with the result that relations (perhaps in the sense of belonging in groups) are grasped. The psychological processes responsible, however, are not yet clear. Such evidence as we have indicates that a given individual may display a typical pattern of abstract-concrete behavior, at least in some situations. We need to know what determines it. To what extent is this behavior a function of the organization of concept systems within the mental context? What roles do inductive and deductive processes play in concrete, as compared to abstract, behavior? Are such characteristics as flexibility, perseveration, and attitudinal factors more significant than the content of concept systems? In brief, the concrete-abstract variable must somehow be related to the learning of concepts and to the organization of the mental context before we can pass beyond the purely descriptive stage into adequate explanation.

To summarize this section, we may say that investigators have revealed many important aspects of the behavior displayed by adults in the typical problem situation, where the task is to classify and organize material according to one or more common principles (concepts). In working through the instances, the subject gradually achieves an understanding of the principle which links them together and thus learns to behave correctly, *i e.*, to give the response called for. He may, however, be able to act properly but still be unable to state the principle correctly. Further-

as a clue to the proper classification of blocks into a double dichotomy (tall-large, tall small, flat large, and flat small), the basis for which is not immediately obvious to the subject. After preliminary explanation of the purpose of the test, the experimenter turns up one of the blocks, thus revealing its name, and asks the subject to select all those that belong with it. If the subject selects all those of the same color, for example, the experimenter turns up one of the wrongly classified blocks and asks the subject to try again, and so on until all the blocks have been correctly sorted. It is possible to score performance in terms of time taken, number of clues (turned up blocks) required, type of solution, etc.

Through the use of this test, these investigators have distinguished three levels of performance, namely, a primitive, "concrete" performance, an intermediate performance showing some aspects of conceptual thinking but not others, and an advanced, conceptual performance. With regard, for example, to interpretation of the task, the subject at the primitive level does not relate the words to the properties of the blocks, so that the names of the blocks are disregarded and the task may be seen as solvable only by trial and error. At the intermediate level, the subject does not grasp fully the nature of the required grouping, *i.e.*, the task may be seen as a game with rules, or only one possibility of grouping is seen. At the conceptual level, the task is understood as involving classification.

Different kinds of groups tend to be formed by individuals operating at the three levels. At the primitive level, grouping may be merely random or in the form of constructions, etc. At the intermediate level, the subject may assemble collections, such as one block of each color, or pseudoclasses, that is, all red blocks, where the basis can be shown to be red, not color. Finally, at the conceptual level, true classes are formed.

Goldstein and Scheerer (20) have also used sorting tests to investigate conceptual behavior and have also found these contrasting approaches. They define the concrete attitude as realistic, that is, dependent upon immediate sensory impressions, whereas the abstract attitude is characterized by detachment from immediate reality, and includes more than the "real" stimulus.

Although these investigators have been primarily concerned with pathological cases, their distinction between concrete and abstract performance may have considerable significance for normal, everyday behavior. Goldstein and Scheerer (20) point out that there are various degrees and gradations of these approaches. It is probable that "the normal individual combines both attitudes and is able to shift from one to the other at will according to the demands of the situation." More work with normal subjects is clearly needed in this area, since other experiments, with different emphasis, have strongly suggested that these attitudes are

children, although this third problem may also be investigated in children. The data have revealed many important relations between the nature and mode of presentation of the material and the resulting performance of the individual. They have also given us considerable understanding of the behavior of the individual in a concept-forming (here, essentially problem solving) situation.

Finally, we discussed a fourth problem, pertaining to the results of concept formation. We emphasized the fact that concepts are symbolic, regulating, or selective, systems, linking separate sensory impressions, dependent upon past experience and organized apart from direct sensory data. A given concept has many aspects, depending upon the attendant conditions of its formation and present use. Thus we have pointed out extensional and intensional aspects, consistency and inconsistency of organization, and hierarchical relations among concepts. Perhaps the key point here is the necessity to distinguish between the name of the concept (the verbal symbol) and the concept itself. The name of a concept is but a label for a complex mental system, with important relations to other mental systems. The verbal symbol, on the one hand, is the name given to a stimulus after the relevant mental processes (the components of the concept system) have occurred, on the other hand, the verbal symbol, or label, may itself serve as a stimulus to activate the concept system.²² Hence concepts have a vitally important function in the selective and regulative processes of behavior. We shall develop this point further in Chapter 15.

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²² Cf. Ogden and Richards (51, pp. 205ff.) and Hebb (29, pp. 130ff.)

more, inconsistent, as well as consistent, concepts may be acquired. Depending upon the properties of the stimuli and the context in which they appear, some kinds of concepts are more readily attained than others. Lastly, performance appears to vary along a hypothetical dimension of concreteness-abstractness with the possibility that a given individual tends to display predominantly a particular pattern in this respect.

Experiments with adults pertain especially, therefore, to Problem 3, the characteristics of behavior in attaining particular concepts. With respect to Problem 4, the properties and functions of concept systems, also, certain implications may be drawn. For instance, we have found that the individual may be able to use concepts without being explicitly aware of the concept itself and that concepts vary in their consistency.

Finally, concrete and abstract behavior may have a counterpart in the properties of concept systems themselves.

CONCLUSION

Even so cursory a survey as we have given in this chapter reveals that concept formation and the use of concepts are subjects of vast importance in the psychology of thinking. Despite the fact that a respectable number of experiments have been conducted, we are still far from an adequate understanding of the many fascinating ramifications of these mental processes.

A clarification of the interrelated problems helps to give some perspective on the whole matter. When this is done, it can be seen that the genetic and acquisition aspects may be different from the problem solving and organizational aspects. In the former connection our evidence indicates that children at an extremely early age are capable of forming and actually do form, concepts and that their greatest limitation is lack of experience and training (probably including vocabulary) rather than deficiency of conceptualizing ability. Nevertheless all our data show that the process of building up a repertory of varied and adequate concepts is a gradual and prolonged affair, extending from as early a period as it is possible to test children into adulthood. It has been assumed that part of this growth and organization of knowledge is a function of increasing mental age, or intelligence. It is difficult to prove or disprove this assumption, but it would be decidedly valuable to investigate the relationship further.

With respect to the third major problem, that of the attainment of a particular concept or group of concepts, it is more meaningful to regard this process as one of the application or reorganization of past experience rather than the acquisition of a "new" concept. In this respect, research with adults is not necessarily of the same nature as research with

children, although this third problem may also be investigated in children. The data have revealed many important relations between the nature and mode of presentation of the material and the resulting performance of the individual. They have also given us considerable understanding of the behavior of the individual in a concept-forming (here, essentially problem-solving) situation.

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Chapter 8. THE TRANSFER-RETROACTION SEQUENCE

One of the most persistent problems in the history of psychology has been that known as the "transfer of training." It concerns the effort to ascertain the effects of learning and practice on later behavior of the organism. In their broadest sense, research and theorization in this area represent efforts to connect, in systematic fashion, the conditions and facts of learning, retention (or forgetting), recall, relearning, and the use, or application, of previous training and experience. Every experiment which deals with the problem of transfer is therefore concerned with a dynamic sequence of events rather than with a simple, specific, and static situation.

Generally speaking, the tendency in psychology to compartmentalize various aspects of behavior has resulted in the placing of transfer under the heading of "learning" rather than of "thinking."¹ Perhaps the reason for this is the fact that, in an experimental situation, where thinking is the object of study, the previous learning experience of the subject is unknown. Hence the transfer effects cannot definitely be stated, and it may seem that they have been ignored. In the preceding chapter on concept formation, for instance, we were dealing with problems of transfer.

In reality, all thinking involves the previous experience of the individual and is therefore basically the transfer of that experience to the present situation. For this reason, it is necessary to extend the principles of transfer to the psychology of thinking. However, an exhaustive treatment will not be given, because extensive reviews are available elsewhere in relation to learning and remembering (7, 38, 49, 53). Instead, we shall attempt to formulate the principles of transfer as they bear upon thinking. Actually, nearly every chapter in this book deals, at least implicitly, with the transfer of experience, as will become abundantly clear in later sections.

¹ Compartmentalization as we have noted before is partly the consequence of our inheritance of reifications from philosophy. It has also been methodologically necessary, in order to segregate problems for practical investigation.

DEFINITION AND SCHEMATIZATION

Figure 8 schematizes the sequence of events involving transfer effects

Symbol	X	A_1	A_2	B	Y
Sequence of events	Past → experience	Learning →	Learning →	Recall →	Relearning, use, thinking etc →
Psychological term for inferred behavioral effect	Context (effect of X on later phases) A_1 is usual starting point experimentally, where context is unknown, ignored or controlled Includes sets determining tendencies, instructions, attitudes, motives, etc	Transfer (effect of A_1 on A_2) May be positive, or negative (called inhibition), or zero		Retroaction or proaction (effects of one learning phase on another learning phase during remembering and later phases) May be negative (inhibition) or positive (facilitation)	

FIG 8 The transfer retroaction sequence

In any situation, the individual brings with him the context of past experience, X , not haphazardly but organized into concepts (as we have seen), attitudes, and other determining tendencies (as we shall see further in Chapters 13 and 15).² Included here are more temporary directing and selecting factors, such as the sets related to preparation, or readiness, for the situation, in an experiment, such sets result from the internalization of the instructions, the perception of the experimenter, the apparatus, etc. Although comparatively little attention is ordinarily paid to factors of this kind, they are actually of very considerable importance (23).

Experimentally, the sequence typically begins with a learning task of some kind, A_1 , to which the subject is exposed with careful control of conditions. The question mark in the schema indicates that transfer is usually unknown or ignored, except for "intraserial effects" (see below). A second task, A_2 , is then presented to the subject (in simple studies of remembering, this stage is omitted). The effect on performance in the second task of having previously performed the first task (measured, for example, by comparing such results with those of a control group which did not perform the first task) is called "transfer." Such an effect may be positive, when performance of the second task is more efficient, negative, when performance of the second task is deleteriously affected, or zero (or, better, indeterminate), when there is no measurable influence

² Nor could we neglect to mention the emotional and motivational factors.

of the previous performance. In order to clarify the usage of terms, it may be pointed out that "interference" and "associative inhibition" are expressions most often employed to refer to negative transfer. Some investigations distinguish between interference and negative transfer, speaking of the latter when the over-all effect is a reduction in the rate of learning and of the former when incorrect response tendencies are present (11).

The next phase is the remembrance of one or the other of the two learned performances, followed, perhaps, by additional training in one of the tasks (relearning). The terms "retroaction" and "proaction" have come into use with reference to the memory stages of the sequence.³ "Inhibition" is the negative term, signifying a loss in the efficiency of remembering as a result of some known previous learning, "retroactive" means the effect of A_2 on the recall of A_1 , and "proactive" means the effect of A_1 on the recall of A_2 . In the event that recall in such a sequence shows a gain rather than a loss, we may speak of facilitation, again, as in the case of inhibition, the effect may be proactive or retroactive.

We have outlined this sequence in detail, despite its familiarity, because there is insufficient recognition of the interrelationships (cf. Os good, 43). Experiments in this field have been inclined to overemphasize some aspect of it at the expense of the others. For example, there is an enormous body of material relating to inhibition and careful little paradigms have been devised to obtain it, with a seeming neglect of the transfer aspects.

It is apparent that the transfer-retroaction sequence has very considerable practical significance for education and for everyday life. For example, it is important to know what conditions of learning in the A_1 phase result in positive or negative transfer in the A_2 phase, what conditions of learning in the preceding phases result in inhibition or facilitation in the B phase, etc. The sequence, however, involves so complex a variety of conditions that it is very difficult to deal with it experimentally. For this reason, presumably, research has tended to concentrate on very simple, rigidly controlled situations, attempting to study one or two conditions at a time. Often, the currently employed types of laboratory situation and procedure seem to be artificial and picaresque when they are considered apart from the total picture of research. "Training" has meant, experimentally, practice in a tangible sense, but actually training may be of other kinds than the performance of an activity. It may be more in the nature of visual observation (watching a movie on basket-

³These terms have apparently evolved as a matter of convenience: there is no reason why "proaction" could not just as well refer to transfer from A_1 to A_2 . It is commonly used, however, in relation to recall and relearning.

ball) or of listening to instructions (how to perform a laboratory experiment in transfer), etc. Perhaps part of the difficulty lies in the fact, as Hebb (18, p. 110) points out, that experiments employing adult subjects are certain to be dealing with somewhat superficial functions, because the adult has already had a long history of learning, hence the transfer effects from practice, per se, have already been previously established. But just how crucial this factor is cannot be determined until more realistic, deeper, and long-range research is carried out.⁴

In any case, a large proportion of the experiments dealing with transfer retroaction have concentrated on that aspect of learning best designated as "memorization" that is, rote verbal learning and literal recall, rather than more dynamic learning situations (themselves probably transfer situations corresponding more to A_2 than to A_1) and the use or application of previous learning. Two observations are necessary, however. In the first place, there have been many transfer experiments dealing with motor behavior, such as 'cross education' and maze learning. Nevertheless, in these studies, too, the laboratory situation is frequently made artificial and rigid in comparison with everyday-life activities. It does not appear to be beyond the realm of possibility to begin to test the findings of the laboratory in more vital situations. At the present time, for example, it would probably be a rare psychologist who would apply with confidence what is known experimentally about transfer retroaction to a situation such as driving a car, playing football, playing the piano, or building a fire. To be sure, educational psychologists have studied the practical effects of classwork and assume generally that learning transfers to later situations. These studies, however, suggest all the more that much of the laboratory work is detached from everyday life.

The second observation is that transfer retroaction undoubtedly enters very significantly into concept formation and problem solving, in both of which more dynamic processes are evident than in the memorization experiment. The compartmentalism previously mentioned tends, however, to make investigators treat these problems as different from those in the transfer-retroaction sequence. There are excellent research possibilities in attempting to relate these situations to each other. A first step might be to devise paradigms employing problem solving tasks rather than memorization.

FACTORS UPON WHICH TRANSFER DEPENDS

Without presenting a detailed summary of the research in this field it is nevertheless pertinent to consider briefly what is known about the

⁴ Cf. the comments of Allport (1 pp. 267ff.)

conditions affecting the nature and amount of transfer.⁵ It will be convenient to formulate these principles in rather general terms, following the lead of other writers who have organized the data in careful detail (7, 8, 14, 38, 49, 53). Additional comments need be made, at the present time, only where recent experimental investigations require them.

LEARNING AND ITS CONDITIONS

Basic, of course, to the whole problem of transfer are the complex conditions which precede the task with respect to which transfer retroaction is measured. As pointed out above, we are almost entirely restricted, in this connection, to short, simple, superficial situations experimentally defined. Hence our discussion concerns the general features of phases A_1 and A_2 of the experimental sequence.

1 Method of Learning It makes a very considerable difference in the efficiency of learning (and of subsequent remembering) how the individual goes about his task. That is, the way in which the subject uses his past experience affects the degree of positive or negative transfer and the degree of inhibition or facilitation in later recall-relearning. Generally speaking, if the individual possesses knowledge of and is able to use—and *does* use—techniques, “tricks,” special information, general principles, etc., his performance will be more efficient than that of the individual who is not so equipped. This condition applies to any phase of the sequence. The learning of A_1 will be influenced by the extent to which the individual can or cannot develop such modes of attack in the A_1 situation itself. Similarly, A_2 will be influenced by whatever techniques may be developed in A_1 . In phase B , remembering will be influenced by the degree to which the individual knows how to use mnemonic devices or principles learned in previous stages which are efficacious in assisting recall. Perhaps it can be said, quite simply, that factors which tend to reduce the mechanical or routine nature of performance increase the likelihood of positive transfer and memory facilitation. Ego involving conditions, for example, have been shown by Prentice (44) to influence markedly both learning and forgetting (see also Chapter 15).

Accordingly, efforts on the part of the experimenter to promote such conditions commonly result in improved performance by the subjects. For example, the informative and suggestive experiments of Katona (24)

⁵ We shall not discuss the doctrine of formal discipline or the research pertaining thereto. It has been effectively disproven as a theory of transfer. At present psychologists are groping toward a more valid theory along lines suggested by some at least of the ensuing discussion.

show that methods of instruction are related to the quality of performance. Methods which assisted the subject to discover or understand "inner relationships" resulted in much more transfer than methods which emphasized mere practice. The former also promoted efficiency in the remembering phases of the sequence. Many other experiments, also, show the positive effects of discovering and applying general principles.

Gibson (14) has well-stated these conditions, as follows:

A major necessity of verbal learning is the establishment of *discrimination* among the items to be learned, and this process of discriminating is actually a fundamental part of what is generally called the learning process. If no discrimination between the items already exists, then the early part of the learning process will see an *increase* in the tendency to confuse the items, followed by the development of discrimination.

Positive transfer will occur in situations where the nature of a second task permits discrimination acquired in a previous task to be beneficial.

Negative transfer will occur when generalization with a previous task occurs, but where the situation is such that discrimination *between some aspects of the two tasks themselves* is required as well as learning of the second.

Retroactive inhibition will occur, similarly, if a second task generalizes with one already learned, and if the situation is such that discrimination between some aspect of the two tasks must be produced before the first can be recalled adequately.

2 *Kind of Material* Experiments have been conducted with a great variety of material ranging from motor activities (such as mirror-drawing and running mazes) and school subjects to the memorizing of lists of nonsense syllables.

a Class of material Studies dealing with transfer from one class to another, such as from one school subject to others, from the memorizing of poetry to the memorizing of other material, etc., have been surveyed and summarized many times, e.g., by Orata (42), McGeoch (38), Woodworth (53). As a general rule, these experiments show positive transfer rather than interference. The effect seems to depend in part upon the factors mentioned above and in part upon interrelations in the materials, to be considered below. That is to say, transfer from one class to another depends upon the degree to which what is learned in one situation can be, and is, used in another situation and upon the amount of material and practice, etc.

It might be observed in passing that this matter of transfer from one class of material to another deserves a reexamination from the experimental standpoint. A great deal of what is now commonly accepted in this connection is based upon rather old research, as experiments in psy-

chology go. Perhaps much more transfer and much less inhibition in remembering, would be found if methods were applied which involve specific instruction in transfer, as, for example, Katona's method of "learning by understanding." Indeed, the trend in education toward this kind of instruction may be increasing the transfer between one school subject and another and between school subjects in general and everyday life. Some of the long-range type of investigation suggested above would be valuable here.

b Meaningful versus nonsense material In general, the more meaningful the material the more efficient is learning (38, pp. 157, 167).^c Thus the more relevant information and experience a subject brings with him into a learning situation, other things being equal, the easier the learning. In the transfer-retroaction sequence, similarly, positive transfer would be more likely for meaningful material in comparison with nonsense material, interference would be less, and there would be less inhibition (14).

The degree of transfer and facilitation as a function of meaningfulness can be formulated in terms of the extent to which the sequence of materials promotes confusion or not. The chances that positive transfer and retroactive (or proactive) facilitation will occur increase as "meaningful relationships within each body of materials (interpolated or original) outweigh confusing relationships between the two sets of materials" (49, p. 28).

3 Interrelations in the Materials By all odds the most research on transfer retroaction has been done on conditions of this kind, especially with regard to inhibition. At least four principal factors are involved.

a Similarity A great problem has been the effect to be expected for various degrees of similarity in the learning materials used in successive tasks. One reason the problem has proven difficult is that, when a second task is similar to the first, positive effects are obtained on some occasions and interference on others. Another reason is the difficulty in defining the stimulus-response relations. That is to say, in some situations the stimulus to which the individual is responding is not clearly defined. For instance, when one memorizes a list of nonsense syllables each item functions as a response but presumably also acts as a stimulus for the next.

^cOf course there are many different degrees of meaningfulness but it would serve no purpose here to attempt precise distinctions. It is probably sufficient to relate meaningfulness to the nature and relevance of past experience in a present situation. In this sense incidentally meaningless material may on occasion be meaningful for example a nonsense syllable may become the name of a series of geometrical figures for the correct naming of which the subject is rewarded.

item. In many experiments which have attempted to determine similarity relations, the problem has been solved by using paired associates, in which one member serves as stimulus, the other as response.

The nature of similarity between materials is itself a problem. Very often, similarity has signified similarity of content (49, p. 7), according to some objectively defined and fairly obvious criterion (*e.g.*, of letters in nonsense syllables, or of sounds). Actually, as can readily be seen from our discussion of concepts and modes of attack, there are many possible kinds of similarity. Gagne, Baker, and Foster, for example, have defined it in terms of stimulus-response relationships within a task (11). These considerations lead to the conclusion that similarity (the degree to which two sets of materials, or two motor tasks, etc., resemble each other) cannot be given a general definition but must be operationally defined in terms of the variables identifiable in specific tasks. Thus two tasks may vary in content, or in methods required for learning, or in other ways. Nevertheless, it is possible to formulate the effect of similarity in general terms, even if it must be specifically defined for a given set of conditions.

Broadly speaking, similarity varies from a situation in which two successive tasks are identical to one in which they are very different in one or more respects. As we have noted previously, it is not likely that two successive tasks are ever totally dissimilar for normal adults.

Thus at one extreme, the second task is merely a repetition of the first, that is, continued practice. This is the ordinary learning situation, and positive transfer would be expected—at least to the point where decrements from fatigue would occur. The introduction of differences into the second task will have an effect corresponding to the nature and degree of the difference and also, as will be shown, to the amount of practice. Thus if the second task is only slightly varied and learning of the first task is not complete, one would expect to obtain interference, as a consequence of confusion between the two tasks.⁷ As dissimilarity is increased, interference and confusion will increase. A point will be reached, however, at which the two tasks begin to be more clearly separate from each other, and interference will decrease. Whether or not positive transfer occurs beyond that point, however, depends upon the applicability of general factors, such as modes of attack. Since this is always a possibility where confusion is at a minimum, it is perhaps better to say that, beyond a certain point of dissimilarity, transfer is likely to be indeterminate.

The foregoing concerns the learning phases of the sequence. The

⁷The nature of the confusion is too complex a problem for consideration here (see, among others, Melton and Irwin, 40, and Underwood, 50).

familiar Skaggs Robinson hypothesis (46) is a statement of the relation between similarity and the efficiency of recall. It is shown in Figure 9. When practice continues with identical material (point *A*), recall is quite efficient. As similarity decreases, recall shows decreasing efficiency, to some minimum (point *B*). Thereafter, as the two tasks become more dissimilar, recall tends to become more efficient.

Experimental work has tended to confirm this general relationship (7, 38, 49)⁸—and it seems to accord also with everyday experience. There

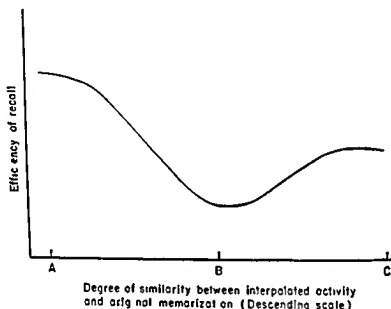


FIG. 9 The Skaggs Robinson hypothesis (from E. S. Robinson, *The similarity factor in retroaction*, *Amer. J. Psychol.* 1927, 39, 299).

is however an experimental situation in which it is possible to be more precise, namely in the paired associate type of memorizing paradigm where the stimulus-response relationships can be controlled more precisely than in one in which more discrete tasks are used.

Figure 10 summarizes the methodology. It may be seen that the three paradigms represent different stimulus-response relations in the learning phases. Although the general relationships have long been known, Osgood (43) has clearly formulated an empirical law for each of the three paradigms as follows:

⁸The experiments by Kennelly (26) cast doubt on the theoretical form of the curve between B and C, although some of his data at least accord with the general trend. As we have pointed out in other connections, other factors must be taken into account, e.g. nature of material, amount of practice with it, etc. See also Boring's analysis of communality relations between two tasks and his proposed theoretical curve (5).

	<i>Learning A₁</i>	<i>Learning A₂</i>	<i>Recall B</i>
Paradigm A	$S_1 \rightarrow R_1$	$S_2 \rightarrow R_1$	$S_1 \rightarrow R_1$
Paradigm B	$S_1 \rightarrow R_1$	$S_1 \rightarrow R_2$	$S_1 \rightarrow R_1$
Paradigm C	$S_1 \rightarrow R_1$	$S_2 \rightarrow R_2$	$S_1 \rightarrow R_1$

FIG 10 Paradigms for the transfer retroaction sequence. One form of proaction situation would be to interchange Learning A_1 and Learning A_2 (modified from Osgood 43)

Paradigm A Where stimuli are varied and responses are functionally identical, positive transfer and retroactive facilitation are obtained, the magnitude of both increasing as the similarity among the stimulus members increases

Paradigm B Where stimuli are functionally identical and responses are varied, negative transfer and retroactive interference are obtained, the magnitude of both decreasing as similarity between the responses increases*

Paradigm C When both stimulus and response members are simultaneously varied, negative transfer and retroactive interference are obtained, the magnitude of both increasing as the stimulus similarity increases

These three principles express, then, for the paired-associate situation the relations which have been stated for the more generalized serial type of situation. They have the advantage of specifying more precisely than the Skaggs-Robinson hypothesis the quantitative relations between degree of similarity and the degree of transfer retroaction when the stimulus-response relations are clearly specifiable.

Gagne, Baker, and Foster (11) have developed a series of hypotheses pertaining to similarity, based on their experimental work with a rather complex discriminative motor task. Similarity is here formulated in terms of variations in stimulus-response relationships within the two tasks, where the second task, A_2 , requires the same discrimination and the same motor response as the first task, A_1 . Positive transfer, they suggest, will occur in all cases, except when a reversal (partial or complete) of SR relationships is involved,¹⁰ a condition when negative transfer will result. In cases where the SR relationships are identical in A_1 and A_2 , positive transfer decreases as variations between the two tasks become greater, when SR relationships are reversed, negative transfer decreases as variations between the two tasks become greater. These principles appear to agree with the general analysis presented above but bring in another kind of experimental plan. Thus where both the stimulus and

* Morgan and Underwood (41) have presented evidence which tends to confirm this law for proactive inhibition.

¹⁰ I.e. when the subject is required to give a response to a stimulus to which he originally learned to give a different response. For example if A_1 involves red—right hand and green—left hand a reversal in A_2 would be red—left hand and 'green—right hand'.

the response in task A_2 are varied but the relationship remains the same as in task A_1 positive transfer occurs, but when the relationship is changed, negative transfer occurs. New paradigms, analogous to Os-
good's might therefore be drawn up for this different version of the tasks. One might say that positive transfer will occur where a relationship learned in task A_1 can be employed without change in task A_2 .

b Interrelations within a series Much of what has been said about the learning and recall of successive tasks applies to items within the same task. In general, the more similar the items, the more interference, that is, the greater the possibilities for confusing successive items, the harder the task will be to learn and the less efficient will be recall (14). In the paired-associate situation, similar stimuli paired with different responses should result in more interference than different stimuli paired with similar responses. In any case, negative transfer and inhibition have been shown to occur within the same task, varying with the kinds of factors previously mentioned (7, 14, 49).

c Amount of material This factor has been varied both for A_1 and for A_2 in the sequence. In general, the most important factor related to the length and complexity of the original material (A_1) is the differential amount of practice achieved for the parts or aspects of the task which are learned earliest (38). Under these conditions, measured interference and inhibition decrease as the amount of material increases because of the added benefit for some parts of the task. When, however, practice is equalized over the whole task, by preventing overlearning of some parts, there seems to be no greater relative loss for long than for short tasks (38, 49).

For the second learning stage of the sequence, A_2 , usually called "interpolated learning," the amount of material is of greater significance (7, 38, 49, 50)—the greater the amount, the more inhibition, either proactive or retroactive, depending upon the setup, in the recall phase, B .

d Time intervals The temporal distribution of activities in a measured sequence has a bearing on efficiency. Except, however, for data relating to the curve of forgetting, this area of research is marked at the present time by inconclusive results—and even the phenomena of forgetting have not been completely ascertained by any means. It appears tentatively that, over long periods of time, separating the learning of the first task, A_1 , and the learning of the second task, A_2 , transfer effects remain essentially constant. In experiments showing such results, "it is a plausible hypothesis that the transfer to the second problem has been chiefly in terms of general factors, such as modes of attack, which are more resistant to forgetting than are specific items" (38, p. 431). In retroaction experiments, it is possible to have the subject learn the second

task immediately after the first with a delay before recall, or immediately before the recall with a delay between the two learning phases, or immediately between the first learning and the recall. No definite conclusion can at present be drawn about the amount of inhibition or facilitation to be expected under these contrasting conditions, although it is probable that differences exist and can be clarified by experimentation which analyzes with sufficient care the variables involved (7, 38, 49)

4 Amount of Practice In general, the more practice the individual has at any stage of the sequence, the less is the interference at any stage. The various formulations worked out by different investigators suggest that increased practice has the effect of reducing the confusion between items and tasks. Gibson's hypothesis that discrimination among the items is a major function of learning is a reasonable one (14). As practice continues, generalization becomes less and differentiation greater. The practice factor may be more specifically formulated for three stages of the sequence, as follows

a Previous experience Generally speaking, the more practice the individual has had with the types of material to which he is exposed in learning situations, the more positive transfer may be expected and the less inhibition (7, 49). This condition refers to what we have called "contextual" factors, corresponding to *X* of the sequence. It includes whatever preparation an individual may have relevant to the learning situation before the specific task under consideration is presented, such as sets, modes of attack, concepts, acquaintance with the methods, etc (10, 12). Harlow (17) has formulated a theory of "learning set," which he defines as "learning how to learn a kind of problem." Although his data are drawn from a limited series of task situations, the principle has great potential significance for bringing stage *X* into relation with later stages of the sequence. Work in his laboratory shows that successive groups of related problems are solved with steadily increasing facility, in short, previous experience with a certain kind of task seems to equip the subject with a technique for learning how to go about mastering new instances (perhaps, suggests Harlow, this represents a gradual development of insight). There is some evidence that a learning set acquired with one kind of problem transfers to other kinds, but the question of how general these sets may be remains open. More research is needed on children, and especially on adult subjects.

b Original material During the early period of learning, there is a tendency for items to be confused. In consequence, both interference and inhibition effects are likely to be great until the materials involved are mastered to some degree of efficiency, beyond the point of confusion (Gibson's "maximum generalization") but short, probably, of complete

learning (as measured by an arbitrary criterion) This relationship is shown in Figure 11, taken from Gibson (14) ¹¹ Thus in the transfer situation, interference in the learning of a second task depends upon how much practice is allowed for the first task ¹² Interference is considerable if learning of the first task is interrupted in the early periods up to a maximum point, but decreases as degree of practice is increased The same principle holds for the retroaction situation, *i.e.*, as practice on the first task increases, inhibition first increases to a maximum and then decreases

c Interpolated material The same general relationship apparently exists for the amount of inhibition to be expected from various degrees of learning of the interpolated material It should be noted, however,

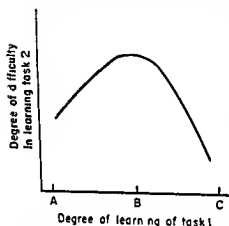


FIG 11 The relation between practice and transfer (modified from Gibson 14)

that the time interval between the successive stages of the sequence at which interference and inhibition are greatest is related to the amount of practice on the two tasks Where the task is well learned interference and inhibition are less soon after the original learning than later, if either task is only imperfectly learned, the opposite effect occurs, that is, interference and inhibition decrease as the interval is lengthened (14) Maximum interference would be expected when both tasks are only imperfectly learned

In summary of the conditions of learning it may be said that the conditions which most definitely promote positive transfer and facilitation of recall relearning are the development of general factors such as modes of attack logical relations in the tasks, and specific instruction directed to that end, the use of meaningful material and an understanding approach to the task, and adequate practice at various stages in the sequence of events

MEMORY AND ITS CONDITIONS

It is of course true that the conditions of learning and remembering are intimately interrelated and that in discussing the former we have

¹¹ Although Gibson's formulation is based primarily upon memorization there seems to be no reason at least at present that it cannot be extended to learning in general [see Gagne and Foster (13) for example]

¹² And also upon the *kind* of practice For example Briggs (6) has demonstrated that learning is facilitated by knowledge of results

also been discussing the latter. Nevertheless, there are several additional points to be mentioned which bear more definitely upon the memory aspects of the sequence.

1 *Length of Interval* Other things being equal, the efficiency of recall and relearning depend upon how long a time elapses between the learning phase(s) and subsequent recall. Generally speaking, the longer the interval, the less efficient recall will be, but the specific amount of loss or error depends upon the degree of practice, the meaningfulness of the material, etc.

2 *Interpolated Activities* Preceding sections have pointed out that the recall of material learned prior to some intervening activity is influenced by the intermediate activity. The effects to be expected under different conditions have been reviewed above. Actually, this matter is an aspect of the interference theory of forgetting, which it is not necessary to discuss fully here. Suffice it to say that the best evidence points to the conclusion that it is not a lapse of time, per se, which causes forgetting (*i.e.*, through fading out of the traces), but the dynamic effects of intervening activities (38, Chap. XI) or of dynamic contextual factors associated with previous experience. Hence the conclusions drawn with respect to the length of the interval signify in part the greater or lesser influence of interpolated activities.

It should be pointed out that we have used the term 'inhibition' to include all the negative effects in recall. There has been a considerable body of research in recent years devoted to proactive inhibition, in addition to the more extensively investigated retroactive effects. Since most, if not all, of what we have had to say appears to apply to proactive as well as to retroactive inhibition, we have not felt it necessary to distinguish between them at all points. At present, the greatest difference between the two seems to be that proactive inhibition is less pronounced, at least after short intervals, than retroactive inhibition (50-51).

3 *Dynamic Factors* No discussion of the transfer-retroaction sequence would be complete without mentioning the phenomena emphasized by the gestalt psychologists (29, 31).¹³

Their thesis is that forgetting is an active process, representing changes and reorganization in the organic traces of the original learning. It rests upon the assumptions that the neurons of the brain are in communication with each other to varying degrees of mutual influence and that energy is continually flowing in the total system. The result is that the traces of past learning are constantly undergoing modification, depending upon their initial strength and organization.

The changes to be expected, other things being equal, have been de-

¹³ Cf. also the discussion of field theory in Chap. 3, above.

scribed as those which lead to "good," or stable, organization. Thus an incomplete word will tend to be remembered as a complete word, many details of a story will be forgotten, or ideas contained therein may actually be distorted to accord with the wishes or mental context of the individual (2, 4), or a figure may be reproduced later with modifications showing a rather definite trend (15). There are many other situations in which perceptual patterns are unstable or ambiguous to the subject, where later recall shows such dynamic changes.

The typical experiments involving the transfer-retroaction sequence are seldom interpreted in terms of the dynamic factors postulated by the gestalt psychologists. There is, however, no real conflict between the more static interference theory and the dynamic, field view. Rather, they complement each other. Negative transfer and inhibition have been demonstrated experimentally, as have the dynamic effects but, to a large extent the experimental emphasis has been different. Retroaction experiments have been more concerned with average, general effects, dynamic experiments more with individual, trend phenomena, the former have been attempts to isolate the external conditions, the latter to determine what goes on in the individual trace system. Hence it may be concluded that the sequence of events and the conditions attendant thereon determine the amount and nature of transfer retroaction (see Prentice 44) and also that the changes which occur, when analyzed in specific detail depend upon the dynamics of organization in the brain in relation to the stimuli with which the individual is confronted.¹⁴

4 *Generalization* The foregoing considerations lead to still another factor in the relation between previous experience and remembering, namely, that learning is more than a simple 1 to 1 connection of a particular stimulus with a particular response. We shall however, postpone further discussion of generalization to the following section.

PERSONALITY CONDITIONS

In addition to conditions of learning and remembering there is another enormously important group of variables relevant to the transfer retroaction sequence.¹⁵ Almost no attention has been paid to the fact that there may be very large and significant individual differences in the

¹⁴ We have not discussed the findings and theory of psychoanalysis here but not because they do not have considerable potential relevance. The dynamic aspects of psychoanalysis with respect to forgetting are actually in good agreement with field theory. More than passing attention will be devoted to psychoanalytic principles in later chapters.

¹⁵ Incidentally the variables subsumed under the heading of intelligence constitute a fourth set of conditions. To a large degree these have been ignored as have those of personality.

amount of transfer and retroaction, to say nothing of more qualitative variables in the learning and remembering situations. Although we suggest that personality development is probably related in many ways to the phenomena discussed above, we shall mention specifically only one possible variable, namely, rigidity-flexibility.

"Rigidity" is a term which has been developed, until the present, mainly in research comparing the behavior of the feeble minded, brain-injured, etc., with that of the normal child or adult (32, 34, 52). It has also been employed in studies of "ethnocentrism" (48). Evidence also comes from behavior in problem solving (35, 36 and cf. "recentering," Chapter 9) and may be related to perseveration (25) and other similar phenomena.¹⁶

There is some argument as to what rigidity means and as to whether or not it represents a quantifiable variable. Quite possibly, several factors are involved, such as the variability of behavior, per se, and the ease and efficiency with which an individual can shift his behavior from one direction to another.

The hypothesis suggested by the available research, regardless of the problem with which it was concerned, is that individuals vary in their efficiency of transfer. We do not intend to dichotomize people into the rigid and the flexible, as is the tendency in studies comparing the sub-normal with the normal, but merely to say that, within the normal range, there is probably a considerable variation in rigidity-flexibility, which is related to the efficiency of transfer. Probably, too, there is a relationship between rigidity flexibility and retroaction, but what it is remains to be determined with certainty.

PRINCIPLES OF GENERALIZATION

The foregoing sections have repeatedly emphasized the fact that learning and remembering are much more complex than would appear from a simple exposition of the objective stimulus-response conditions. One important aspect of this complexity relates to the fact that learning equips the individual with broad patterns rather than 1 to 1 relationships. Two principles of generalization have been formulated to take this into account, making explicit much of what has been said previously in this chapter (especially with reference to interrelations in the material) and in Chapter 4 about association of ideas and redintegration.

On the one hand, there is a generalization of stimulating conditions, on the other, a generalization of response.¹⁷ The two laws are as follows:

1. Each new stimulating condition tends to elicit the response which

¹⁶ Cf. also Hilgard (19, pp. 339ff.)

¹⁷ Cf., in addition to references cited, Hull (22, Chap. XII).

scribed as those which lead to "good," or stable, organization. Thus an incomplete word will tend to be remembered as a complete word, many details of a story will be forgotten, or ideas contained therein may actually be distorted to accord with the wishes or mental context of the individual (2, 4), or a figure may be reproduced later with modifications showing a rather definite trend (15). There are many other situations in which perceptual patterns are unstable or ambiguous to the subject, where later recall shows such dynamic changes.

The typical experiments involving the transfer-retroaction sequence are seldom interpreted in terms of the dynamic factors postulated by the gestalt psychologists. There is, however, no real conflict between the more static interference theory and the dynamic, field view. Rather, they complement each other. Negative transfer and inhibition have been demonstrated experimentally, as have the dynamic effects, but, to a large extent, the experimental emphasis has been different. Retroaction experiments have been more concerned with average, general effects, dynamic experiments more with individual, trend phenomena, the former have been attempts to isolate the external conditions, the latter to determine what goes on in the individual trace system. Hence it may be concluded that the sequence of events and the conditions attendant thereon determine the amount and nature of transfer retroaction (see Prentice, 44) and also that the changes which occur, when analyzed in specific detail, depend upon the dynamics of organization in the brain in relation to the stimuli with which the individual is confronted.¹⁴

4 *Generalization* The foregoing considerations lead to still another factor in the relation between previous experience and remembering, namely, that learning is more than a simple 1 to 1 connection of a particular stimulus with a particular response. We shall, however, postpone further discussion of generalization to the following section.

PERSONALITY CONDITIONS

In addition to conditions of learning and remembering, there is another enormously important group of variables relevant to the transfer-retroaction sequence.¹⁵ Almost no attention has been paid to the fact that there may be very large and significant individual differences in the

¹⁴We have not discussed the findings and theory of psychoanalysis here but not because they do not have considerable potential relevance. The dynamic aspects of psychoanalysis with respect to forgetting are actually in good agreement with field theory. More than passing attention will be devoted to psychoanalytic principles in later chapters.

¹⁵Incidentally, the variables subsumed under the heading of intelligence constitute a fourth set of conditions. To a large degree, these have been ignored as have those of personality.

TABLE 3 AN ILLUSTRATION OF GENERALIZATION GRADIENTS FROM EQUIVALENT STIMULI EXPERIMENTS OF KLUVER (27)*

Stimulus pair	Trials		Errors		Percentage of errors	
	GM	IR	GM	IR	GM	IR
Training stimuli †						
Rectangles 300 sq cm vs 150 sq cm	413	402	14	18	3	4
Size variations same shape rectangles in sq cm						
150 vs 75	45	45	5	1	11	2
600 vs 300	60	75	17	21	28	28
1 536 vs 768	70	55	32	27	46	49
8 64 vs 4 32	20	30	10	16	50	53
Shape variations all figures 300 sq cm vs 150 sq cm						
Irregular	30	41	0	0	0	0
Squares	35	23	1	2	3	9
Circles	40	30	2	2	5	7
Hexagons	20	50	2	2	10	4
Triangles	30	40	14	9	46	23
Crosses	30	15	13	6	43	40

* The subjects were Java monkeys GM and IR refer to the subjects

† Series of training stimuli were of course interspersed throughout the experimental period

related (equivalent) stimuli Furthermore the degree to which stimuli other than the original stimulus will call forth the learned response varies with the closeness of the relationship Thus the relationship may be defined in terms of gradients of equivalence or generalization Two examples will illustrate the point

Kliver (27) has carried out an extensive and admirable series of experiments on monkeys The method was that of presenting the animals with pairs of stimuli attached to food boxes The animals could obtain the food by pulling one of the boxes to the cage by means of a string Training was first given in the discrimination of a particular pair of stimuli one of which was rewarded, the other not After this task had been learned to a point of consistency, but not necessarily perfection, various pairs of critical stimuli were introduced both of which were rewarded¹⁰ Although Kliver employed many different kinds of stimuli, including kinesthetic, auditory, and visual variables we shall present only a series involving variations in the size and shape of geometrical figures Table 3 gives some re-

¹⁰ Rewarding both critical or test alternatives in experiments of this kind is a standard procedure presumably to prevent additional learning

has been connected with similar stimulating conditions in the past (9, 38). This principle has been called the "law of assimilation"

2 A given stimulating condition, once connected with a given response, will also elicit other responses which are related in some way to the first, or trained, response (38, 47) "Response" here may be taken to include sets and other general factors associated with the previous stimulus. This principle has been called the "law of response generalization" (38)

Still a third principle follows from these as a further step in defining the relationship. A given learning situation results also in stimulus response generalization, whereby stimuli related to, but not specifically presented with, the original stimuli evoke responses related to, but not specifically evoked by, the originally learned responses (Hull, 22, p 183)

Learning occurs, therefore, basically as generalized relationships on both the stimulus and response side. The individual comes to respond not only to a specific stimulus but also to related stimuli, a given stimulus will elicit not only a response to which it has specifically been connected but also related responses, and a related stimulus may evoke a related response.¹⁸ In a specific learning task, such as the commonly used memorization of lists of nonsense syllables, practice has the effect of differentiating from the generalized patterns only those which are specifically called for (*i.e.*, reinforced), and of consolidating the differentiated items (14). But, presumably, such practice only temporarily results in differentiation for that particular situation, and the generalized relations become latent (or are ignored by the investigator). Finally, it may be noted that, even when practice has resulted in highly differentiated stimulus-response relations, there are still the generalized relations, as stated in the two laws, although they are not readily apparent, because of the dominance of the measured response. For instance, the instructions, experimental conditions, sets, modes of attack, etc., are generalized from one task to another.

The laws which we have stated are really not all-or-none propositions but may best be understood in terms of *gradients of generalization*. The evidence comes from studies of transposition behavior (30, 33), from conditioning (20, 21, 45), from experiments on the equivalence of stimuli (27, 28, 37, 39) as well as from many less direct sources. Indeed, experiments on concept formation (Chapter 7) are important evidence for this conclusion.

In general, all these experiments show that a subject trained to respond in a given way to a particular stimulus will also respond in that way to

¹⁸ As Kluver points out, these generalization phenomena do not mean that the individual cannot distinguish one item from another (27, p 8)

TABLE 4 AN ILLUSTRATION OF A GENERALIZATION GRADIENT IN SEMANTIC CONDITIONING FROM THE EXPERIMENTS OF RAZRAN (45), BASED UPON MEANS OF 20-80 MEASUREMENTS

Word category	Example of conditioned word	Example of related word	Per cent of specific generalization
Word derivative	Lock	Latch	64.5
Subordinate	Dog	Terrier	42.6
Contrasts	Dark	Light	40.5
Part whole	Day	Week	39.8
Whole part	Flower	Petal	38.8
Coordinate	Dog	Cat	38.2
3 of 4 common phonemes 5 of 6 common letters	Flower	Glower	35.1
Predicative	Dog	Bark	35.0
2 of 3 common phonemes 3 of 4 common letters	Dark	Mark	31.6
Suprordinate	Dog	Animal	22.9
2 of 4 common phonemes 4 of 6 common letters	Flower	Shower	20.2
1 of 2 common phonemes 2 of 3 common letters	Day	May	19.6
Pseudoderivative	Bake	Book	13.1
Compound words	Yankee	Doodle	12.6

Further work in the area which Razran has opened up should have great importance for the understanding of transfer and retroaction. What, for example, is the possible significance of generalization gradients for what otherwise appears to be "free imaginative activity" of the artist? To what extent is "recentering"²² in problem solving linked with, or independent of, generalization gradients? Are distortions such as those evident in rumors, false testimony, etc., understandable, in part, in terms of generalization resulting from the original stimuli? Perhaps it is too soon to suggest questions of this kind, but some day we may be able to answer them.

SIGNIFICANCE OF TRANSFER RETROACTION

Finally, it may be pertinent to indicate some of the ways in which the sequence we have been discussing is related to various aspects of thinking. Although it is an oversimplification, we may say that the general conditions which result in either transfer or retroaction are laid down prior to the situations in which thinking is said to occur. In consequence, it is difficult or impossible to say whether there is a transfer or retroac-

²² See Chap. 9

sults for two Java monkeys tested over about a month's time. For the sake of simplicity, the table presents the sum of all series in which each monkey was tested on the pair shown and omits some of the variations in stimuli. We have also rearranged the pairs to bring out the degree of equivalence.

The results show that the two monkeys gave the same discrimination response to stimuli different from, but related to, those between which they had been trained to discriminate. Kluver was more interested in determining equivalent stimuli than in gradients as such, nevertheless, the strength of the response, as measured by the percentage of errors, tends to decrease the more different the new stimuli are from the original pair. In this case, of course, the gradient varies between 0 per cent errors and 50 per cent errors, since the latter represents what would occur by chance.²⁰

Careful experiments with a different technique by Harlow and his co-workers cast further light on generalization gradients in monkeys. In one series of experiments, clear gradients for response to variations in height and brightness were obtained (16). The gradients appeared to be linear, *i.e.*, accuracy of response decreased about equally for equal variations in the stimulus objects.

Our second illustration comes from the ingenious and carefully controlled experiments of Razran (45). He has devised a method of salivary conditioning for use with human subjects which follows very closely the classical conditioning paradigm of Pavlov. Table 4 shows the results for two groups of subjects tested with different sets of words. The "per cent of specific generalization" represents the degree of conditioned salivation to the related words over and above that to nonrelated control words.

It is apparent that Razran has demonstrated a phenomenon of major importance. When a conditioned response is established to a given word other words not specifically conditioned will nevertheless call forth the conditioned response, but to lesser degrees, depending upon the relationships among the words. Differences between adjacent categories are usually quite small, and hence their exact sequence is not proven by this experiment; however, there can be no doubt that a gradient exists (differences of about 6 per cent are statistically significant). Especially noteworthy in these data is the roughly quantitative scale based upon the number of sounds (phonemes) and letters which two words have in common.²¹

²⁰ Actually, more than 50 per cent errors could occur were some factor causing the animal to choose the wrong stimulus.

²¹ More than likely, the learning situation results in generalization in several directions at the same time (cf. Hull, 22, Chap. XII).

CONCLUSION

Putting together quite simply what has been said about transfer retroaction, we may say that thinking, as an active process, involves the application, organization, and reorganization of past experience. In the first place, therefore, it depends upon learning and its conditions, and, in the second place, it depends upon retention and recall, in some form and degree, of what has been learned. Past experience is not recorded in terms of specific units but is generalized and thus is capable of being transferred to subsequent situations. It is probable that the stimulus-response relationships associated with learning are gradients of generalization.

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tion effect That is to say, in the laboratory experiment which purports to investigate thinking, as well as in everyday life, the rather neat sequence postulated above breaks down Presumably, we are dealing with a situation beyond, or later than, the *B* of the sequence, at the *Y* stage and subsequent stages Perhaps the experimental setup could be extended in some complex fashion, so that the relation between *A*₁, *A*₂, and *B* and *Y* could be shown Meanwhile, we must speak in more general terms and assume that either transfer or retroaction effects, or both, are influencing the course of thinking

It seems clear that transfer and retroaction both enter intimately into the formation of concepts and their use Thus we say that the linkage of objects of experience occurs through transfer, that is, that previous learning with instances having some kind of similarity to each other influences the learning of new instances In this sense, all the conditions of transfer and retroaction which have been mentioned are relevant to concept formation Furthermore, concepts themselves, once attained and given symbolic representation, may serve as the medium for the application of past experience to present activity—or they may correspond more nearly to *A*₂ of the sequence and interfere with the adequate manipulation of present experience

In problem-solving situations, similarly, we must suppose that both transfer and retroaction effects are influencing the course of behavior, either facilitating or interfering with performance Such effects may depend upon conditions within the problem-solving situation itself, beginning with the first exposure of the individual to it, or the effects may depend upon conditions preceding immersion in the task

Creative activity, to be discussed in Chapter 12, involves all the conditions of the transfer-retroaction sequence The artist or the inventor must, perforce, employ his past experience, either consciously or unconsciously, in evolving his product In doing so, he is subject to both transfer and retroaction effects, as determined by the conditions under which his materials of experience were accumulated and are at present utilized

All the phenomena of personalized thinking which we shall consider in later sections are closely bound up with the principles of transfer retroaction Determining tendencies of all kinds may well be thought of as mechanisms by means of which transfer occurs from one situation to another, just as are the modes of attack, sets, and concepts mentioned above

Thus in a very real way the psychology of thinking depends at all times upon the transfer retroaction sequence Certainly, this sequence is always implicit in thinking

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of thinking places it at a point beyond the learning phases (see Figure 8, page 137) This distinction, of course, is artificial, as we have noted before, and many psychologists seem to regard problem solving simply as a kind of adult learning. There is no real reason that it should not be so viewed, especially where the main interest is in studying behavior in repeated exposures to the same situation or, perhaps, where emphasis is on the acquisition of new skills In this chapter, however, our interest lies in ascertaining how an individual uses past experience in meeting a problem situation occurring in the present For the most part, we shall not deal explicitly with motivational problems (why the individual wants and tries to solve the problem) or with those features of behavior which become particularly important when problem solving is studied from the standpoint of learning theory Hence we shall not here go much into questions such as the role of repetition or the function of reward Chapter 13 deals in part with these matters

PHASES OF PROBLEM SOLVING

In analyzing behavior in a problem-solving situation, three stages may logically be distinguished

1 *Confrontation by a Problem* In this first stage, a situation, as formulated above, is present, involving a goal together with an obstacle or difficulty between it and the individual There follows some realization by the individual that such a situation exists Motivation to overcome the difficulty ensues, accompanied by effort to attain the goal

2 *Working toward a Solution* In the intermediate periods, the individual engages in activity to relieve the tension built up in the first stage Assuming that the individual strives to attain the goal and does not run away or merely make no response, the activities engaged in are typically of three kinds There may be *mental, or symbolic, processes*, such as inspection, calling upon past experience, relating one part of the situation to another, etc., there may be *manipulation* of the materials available, and there may be *verbalization*, such as interpreting the situation, expressing frustration, assigning names to the materials, etc Clearly, these activities are not mutually exclusive but may, and often do, all occur simultaneously

3 *Solution* As an outcome of the foregoing activities, the individual may reach the goal or he may fail to reach it Results in the individual may be understanding, relief of tension, emotional effects such as satisfaction or pleasure, a cessation of activity, or some modification of behavior Results in the environment may be an organization or reorganization of materials or relationships, removal of the obstacle, or a change in the situation (thus a child may take possession of a toy which has constituted the goal object) It is also necessary to point out that failure may

✓ Chapter 9. PROBLEM SOLVING

In this chapter we shall consider the behavior that occurs in a particular type of situation, namely, a problem situation. In situations of this kind, we may say, for convenience, that thinking occurs primarily in relation to the external world and is determined primarily by conditions therein. In contrast, later chapters will deal with behavior which occurs primarily in relation to inner needs (imagination and autism) and with the systems which control and regulate thinking (personalized aspects of thinking). Creative thought really seems to be intermediate between problem solving and imagination, occurring in special situations involving nearly indistinguishably problem-solving behavior and imagination.

Thus we agree with Murphy (46) that mental processes are bipolar in nature, determined, on the one hand, by the external world and, on the other, by inner needs. From moment to moment, these influences interplay in the course of thought, with external stimuli dominating at one time and internal stimuli at another. At no time can it be said that either is independent of the other, but it is possible to distinguish general conditions under which one set of factors has a stronger influence than the other. In problem situations, the normal person is behaving more in relation to the demands made by the external conditions, in imaginative thinking the individual is responding more to the inner-need conditions of the moment, more or less independently of the external conditions.

In both cases thinking may fruitfully be regarded as adjustment behavior. In a problem solving situation, the individual is confronted by external conditions in which an obstacle or difficulty must be overcome to reach a goal. The circumstances must be of a kind which will arouse sufficient tension to make the individual strive to attain the goal and thus to reduce the tension. In imagination, the individual is responding to internal need conditions which have reached a point of tension sufficient to seek outlet in some way.

If the formulation above represents the two extremes, then thinking ranges between them, approaching one pole or the other, depending upon the circumstances.

It will be observed that our treatment of problem solving as an aspect

animals primarily in an historical fashion, to point out the origins of various approaches to the study of problem solving

"TRIAL AND ERROR"

The concept of trial-and-error problem solution has had a long history, marked by much bitter argument. At the present time, however, there is no longer any need to debate the value of the principle as an explanation of how solution is achieved. It may simply be regarded as one kind of behavior which occurs in problem situations along with other kinds of behavior.

It is not necessary to review in detail the familiar story of the development of the notion of trial and error. It originated in studies of animal learning, notably those of Thorndike with cats (54). The subject was placed in a puzzle box, the door of which could be opened by moving a button, or by pulling a loop of wire, or by some other simple mechanism. An incentive, food, was placed within sight and smell of the animal, with the result that it struggled to obtain the food.¹ In the course of time, an accidental movement would open the door and the cat would escape and obtain the reward. Upon successive repetitions, much the same process would be repeated, until such time as the cat would quickly and efficiently move the button, pull the loop, etc., open the door, and obtain the reward (or be unable to solve the problem, make no effort to do so, etc.). The learning which occurred in this kind of experiment led Thorndike to say that the animal was solving the problem in an essentially blind and accidental way. Later investigators have repeated Thorndike's experiments under conditions as similar to his as possible (1, 19). Although they differ in theoretical interpretations, such as emphasis upon stereotypy and degree of blindness or meaningful ideation, these studies have revealed essentially the same general phenomena. An adequate definition of trial and error will fit them all.

Many other types of problem situation have been devised to study animal learning (26, 57), most of which have been extended to human subjects. The maze task, for example, has become a standard one for experiments with animals. In many ways, it is an ideal problem situation, since it is a definitely defined one, with a start, a correct pathway, and an end. Overt errors can readily be determined and performance recorded in quantitative terms. A more difficult type of situation is exemplified by the double alternation problem. In one version of the task, the maze principle is employed, that is, the subject actually traverses a pathway, learning which sequence of alleyways to follow (18). In another ver-

¹ It is not certain that the food acts as the real incentive, Thorndike suggests that escape is more important than food at least at first.

be an outcome with important effects. We shall not be concerned here with developing the failure aspect of problem solving, but it should not be ignored (cf. Lantz, 36).

Of these three stages in problem solving, by all odds the most research has been directed toward understanding the intermediate phase. Nevertheless, the other two phases are very important and have not been neglected.

EXPERIMENTATION ON ANIMALS

In the scientific study of problem solving, nearly every line of investigation has originated in experiments with animals. Although the emphasis in this book is on thinking in the normal human being, it is impossible to present adequately what is known about problem solving without including some of the animal studies. For this reason, it is worth while to deal briefly with the significance of this kind of research.

The advantages of using animal subjects are well known (55). For one thing, it is comparatively easy to control the conditions of investigation, for the experimenter can specify and regulate not only the environmental conditions under which the subject performs but also the life history, from such specific factors as diet and exercise to more general ones such as previous learning experience. Furthermore, since lower animals are less complex than man, it is evidently possible to observe behavior at a more simple level. Finally, as a corollary to these advantages, it is easier to observe animals than human beings, that is, one can come closer to recording all that the subject does. For reasons of this kind, animal behavior has frequently turned out to be a valuable source of hypotheses relevant to human thinking.

Of course, the advantages of using animals should not be overemphasized. The differences between lower animals and man make it necessary to verify and extend to the human level conclusions reached in animal studies. These differences also limit the kinds of problems which can meaningfully be dealt with on the animal level. Human beings have superior powers of observation and very much more complex and varied mental processes. They also possess language functions. Human subjects therefore must be employed whenever the situation demands these complex functions. In any case, if some kind of verbal report is wanted, as an indication, let us say, of what is going on inside the nervous system, human subjects are obviously required. In a practical sense, these considerations mean that no matter what conclusions may be based on animal studies, they must be verified with human beings, since any of, or all, these differences may be involved.

In the sections which follow, we shall make use of experiments with

the whole situation can be understood, then some trial and error, whether "blind" or not, must occur (cf Morgan, 45) ²

Finally, it must be emphasized that, by stating these characteristics of trial and error, we do not intend to separate it from other behavior in problem situations, since it may serve as a preliminary stage prior to the adoption of other modes of attack, etc. The foregoing is merely a first approximation. In later sections, when detailed studies of human problem solving are discussed, it will be necessary to amplify the conditions suggested by Woodworth and to relate them more fully to human problem-solving behavior.

INSIGHT

After a great deal of misunderstanding and one-sided emphasis, psychologists are finally beginning to place the notion of "insight" in its proper relationship to other aspects of problem solving. Perhaps there are two main reasons why so much controversy has raged around this essentially simple and common sense term ³. In the first place, it was developed intensively at a time when behavioristic interpretations were prevalent in America. For a long time, it seemed that the concept of insight did not fit into the basically mechanical and quantitative theories of mental functioning which dominated psychological thinking (28, Chap. 7). In the second place, it has taken a generation for adequate experiments to be conducted which could ascertain in sufficiently objectively defined and varied situations what actually happens in problem solving. We still are far from having the final answers, but at least very considerable progress has been made. What, then, have been the confusions surrounding the idea of insight?

One has been the tendency to accuse the gestalt psychologists, notably Kohler, who have been instrumental in developing the concept, of postulating a mysterious kind of mental agency or process as an explanation of how the solution is attained. Actually, this accusation is not warranted, although the writings of gestaltists have not always been clear as to just what they *do* mean.

Instead, it is regarded as a descriptive term (33, pp. 628ff, 35, p. 341). It has represented Kohler's efforts to emphasize the fact that the solving of a problem does not necessarily occur as a "blind" fumbling but as a

²Besides these two aspects of trial and error as (1) conditions of performance and (2) behavior, it may be defined in another way, namely, as (3) mode of attack (see pp. 182ff.)

³We shall not here review the history of this controversy, which has often been done elsewhere. See Hilgard (28 Chaps. 2 and 7). Our aim is to formulate a comprehensive view of problem solving which takes into account as many aspects as possible.

sion, the subject solves the problem merely by opening, say, the correct one of two boxes (29). The problem is to learn the principle that pairs of identical choices alternate. For instance, in a T pattern, food will be found twice in succession at the left end of the cross alley, then twice at the right end, then twice at the left, and so on. The series may be extended to eight or more double alternations.

When these problems are presented to human subjects, they show the same general characteristics of response. Quantitatively, the record of performance, as shown by the learning curve, is very similar. Qualitatively, there is exploration, chance success, and gradual increase in mastery. Some important additional characteristics appear, however, which seem to be associated with the differences between animals and human beings mentioned above. For instance, in the maze situation, human subjects often employ visual imagery (evidence for which, of course, can hardly be obtained in animals) and verbalization, both of which increase the efficiency of performance in comparison with a purely motor mode of attack (30, 56). This improvement is especially pronounced for verbal methods of solution. Similarly, in the double-alternation situation, human subjects make extensive use of verbalization to formulate proposals for solution, to symbolize previous successes and failures, etc. (18, 29). Thus it will be necessary to take account of these differences in applying trial-and-error principles to human thinking, and we shall do so in later sections.

Woodworth (60 p. 294) has clearly set forth the "minimum essentials" of trial and error, as revealed in animal experiments, as follows:

1. A 'set' to reach a certain goal
2. Inability to see any clear way to the goal
3. Exploring the situation
4. Seeing or somehow finding leads, possible ways to reach the goal
5. Trying these leads
6. Backing off when blocked in one lead and trying another
7. Finally finding a good lead and reaching the goal

In stating these "essentials," we are really defining two things. On the one hand, we are specifying the typical characteristics of trial and error whenever it occurs. On the other hand, we are also specifying the kind of situation in which at least some trial and error will almost certainly occur, whether the subject is a rat or a monkey or a human being. If there is no way to figure out in advance how to solve the problem, if a multiple, varied attack is required (e.g., to familiarize oneself with various alternatives), and if it is necessary to go through preliminary stages before

standing" approach, in which the individual is seeking to discover the inner relations of the material and the principles whereby a solution may be reached. We shall try to clarify these points later, after reviewing some of the experimental data. For the moment, we might label the first form of attack "insight" and the second "analytic, or understanding, insight."

As for the third usage, it might be well to abandon the term "insight" altogether, especially if there is any danger of implying an explanatory rather than a descriptive concept. Instead, the kind of solution meant might be termed, simply, "sudden solution" with "direct awareness of determination" (35, p. 341) in contrast to "accidental solution" without such awareness. And there might be added such other solutions as those gradually achieved, but with understanding, and those achieved with partial understanding, etc.

The truth of the matter is that the notion of insight has been so imperfectly defined that some such treatment as the one above is required if we are to make adequate use of the undoubtedly important facts which it has been developed to describe.

At least twenty rather distinct characteristics of insight have been suggested.⁴ Among them are general factors like the ability of the subject to repeat the solution readily and to transfer the solution or principle thereof to other situations. Insight has been linked with various aspects of behavior prior to solution, including the application of relevant past experience, controlled attention, and foresight. More often, it is likely to be defined in relation to the solution itself, namely, in terms of suddenness, confidence, completeness, relief, satisfaction, etc. No value would be served in a detailed presentation of all these alleged criteria, inasmuch as they are marked by the confusions just mentioned. Furthermore, they are so often dependent upon a particular theoretical framework that it will be more fruitful to approach the problem of definition more cautiously, by exploring the pertinent research on insight. Let us now turn to this research and after that to broader experiments, by means of which the various principles of trial and error and insight can be placed in proper relation to each other.

THE EXPERIMENTS OF KOHLER

It was the famous experiments with chimpanzees of the gestalt psychologist, Wolfgang Kohler (34), which set the stage for most of the experimental work on insight, although his research is complemented by

⁴ Among the writers who have formulated various supposed characteristics of insight are Yerkes (61-62), Hilgard (28), Hartmann (20-21), Henry (25), Peckstein and Brown (47), Kohler (34-35), Koffka (33), Duncker (13-14), and Durkin (15).

consequence of understanding the relations within aspects of the task, what needs to be done to achieve the solution, etc. As Hilgard points out (28), there is nothing surprising in this view of problem solving, but it is nevertheless easily lost sight of in a mechanistic view of mental processes.

A second confusion arises if one uncritically accepts the opposite thesis that *all* problem solving is the result of insight, *i.e.*, implicitly assuming it to be an explanation. If one explores sufficiently, one often finds that the investigator who adopts this approach really means that solutions achieved through "insight" (here equivalent to "understanding") are "intelligent" solutions, whereas others are not (*e.g.*, 13, 14). To the extent, then, that only intelligent solutions are admitted to consideration, insight is used to describe (or to explain, without clear distinction) only some solutions, but as if they represented *all* solutions. This confusion is resolved by recognizing the value judgment involved in the argument and also by broadening one's experimental knowledge of problem situations.

Still a third kind of confusion, and the most important, as in trial-and-error concepts, is the fact that several orders of conceptualization are intermingled in the same word, without clear distinctions among them. In this case, three such orders may be pointed out. (1) "Insight" means that the individual understands what he is doing and how the solution was achieved. (2) 'Insight' refers to a mode of attack—an approach where the inner relations, or basic principles, are sought (as contrasted with a blind attack—a limited view of trial and error). (3) 'Insight' refers to the kind of solution achieved, *i.e.*, one which is sudden, confident, and "complete". No one of these usages is either right or wrong, all three express some of the facts. It would appear that the term "insightful" could fruitfully be employed for the first usage, in this way, there is no need to contrast 'insight' with 'trial and error,' since the latter, as we have seen, is almost certain to occur in some situations, where it may be insightful as far as conditions permit. Furthermore, there are occasions on which trial and error may deliberately and wisely be utilized by the individual. For these reasons, blind activity rather than trial and error might be considered the process contrasting with "insightful."

It would be better to reserve the term 'insight' for usage (2) and to contrast with it a trial and error attack. In order to do this however, two points must be made clear. In the first place, the nature of trial and error as a mode of attack must be understood in the terms suggested in this chapter. In the second place it must be recognized that insight itself really includes two contrasting modes of attack. On the one hand, it may signify an approach in which the individual engages in essentially exploratory, or even blind, activity and merely waits, so to speak for the solution to appear. On the other hand, it may signify a controlled, deliberate, "under-

whose branches can be easily broken off. It is impossible to squeeze the tree through the railings, on account of its awkward shape, besides, only one of the bigger apes could drag it as far as the bars. Sultan is let in, does not immediately see the objective, and, looking about him indifferently, sucks one of the branches of the tree. But, his attention having been drawn to the objective, he approaches the bars, glances outside, the next moment turns around, goes straight to the tree, seizes a thin slender branch, breaks it off with a sharp jerk, runs back to the bars, and attains the objective. From the turning round upon the tree up to the grasping of the fruit with the broken off branch, is one single quick chain of action, without the least 'hiatus,' and without the slightest movement that does not, objectively considered, fit into the solution described (pp 103-104)

4 Partial Making of an Implement

The previous experiment with the gymnastic rope is repeated, and made more difficult. The objective is on the same spot (about two and a half metres' distance from the gymnastic apparatus), but the rope, instead of hanging loose, is laid in three firm coils starting from the hook, around the upper cross-beam, into which the hook is screwed. The coils are neat and orderly, do not cross each other, and can be easily surveyed by the human observer. The free end of the rope is now the part furthest away from the objective and hangs only about thirty centimetres down from the cross beam. As soon as Chica sees the objective, she climbs up the apparatus, seizes the middle coil of the rope underneath the cross beam, and pulls it once downwards, then again with increased strength, so that the rope, except for one coil nearest the hook, is thrown over the beam, and hangs down. Without bothering about this last coil, she now tries to swing herself at once to the objective, twice running she is unsuccessful, as the rope like this is too short and cannot be swung properly. Instead of remedying this deficiency, Chica tries a third time, starting off with a still bigger jump, she jumps away from the rope in a big curve through the air and towards the objective, seizes it and tears it down with her as she falls. The solution is genuine, and the energetic attempts to make the rope hang down are made as soon as the animal has surveyed the situation, but she takes no notice at all of the nature of the coils, she merely seizes the rope in the middle and pulls it down (pp 112-113)

5 Building a High Structure

The objective hangs still higher up, Sultan has fasted all the forenoon and, therefore, goes at his task with great zeal. He lays the heavy box flat underneath the objective, puts the second one upright upon it, and, standing on the top, tries to seize the objective. As he does not reach it, he looks down and round about, and his glance is caught by the third box which may have seemed useless to him at first, because of its smallness. He climbs down very carefully, seizes the box, climbs up with it, and completes the construction (p 138)

the extensive investigations of Robert M Yerkes (61) The problem situations which they devised have served as prototypes for many subsequent experiments

In these familiar experiments, Kohler observed the behavior of his chimpanzees in a wide variety of situations requiring "roundabout" methods of solution, such as fetching an objective when it has been thrown through a window, using implements like sticks and boxes to reach bits of food, making implements, building simple structures to obtain suspended objectives, and using one implement to obtain a second implement by means of which food could be obtained The most effective way to summarize the nature of these experiments is to present examples in Kohler's own words For this purpose, five brief protocols have been selected *

1 *Using an Implement*

On the second day after his arrival, Koko was, as usual, fastened to a tree with a collar and chain A thin stick was secretly pushed within his reach, he did not notice it at first, then he gnawed at it for a minute When an hour had elapsed, a banana was laid upon the ground, outside the circle of which his chain formed a radius, and beyond his reach After some useless attempts to grasp it with his hand, Koko suddenly seized the stick, which lay about one meter behind him, gazed at his objective, then again let fall the stick He then made vigorous efforts to grasp the objective with his foot, which could reach farther than his hand, owing to the chain being attached to his neck, and then gave up this method of approach Then he suddenly took the stick again, and drew the objective towards himself, though very clumsily (p 33)

2 *Ineffectual Attempt to Use a Jumping Stick*

Rana makes an unprepossessing impression when she prepares to "take off" for a high jump and the stick is too short The other apes would look and then throw away the pole, or at most make one attempt and then give it up Not so Rana, she props up the stick, attempts to climb it, stops, turns the stick as though that would make it grow longer, lifts one leg, lowers it again, and repeats this process a number of times, a picture of confusion and helplessness Finally, as a rule, she squats down, lets the stick fall to earth, and stares vacantly around (pp 72-73)

3 *Making an Implement*

Beyond some bars, out of arm's reach, lies an objective, on this side, in the background of the experiment room, is placed a sawed off castor-oil bush

* These excerpts from Wolfgang Kohler's *The Mentality of Apes* (trans by E Winter), 1927, are reprinted with the permission of the publishers, Harcourt Brace and Company, Inc

and solutions. She observed 44 children, ranging in age from 19 to 49 months, in two series of standardized situations. The first series consisted of five problems in which it was necessary to use an object (a large block, a chair, or a box and a block) to attain a toy suspended from the ceiling. The second series involved the use of implements to reach objects located at a distance from a play pen. Thus Series I corresponded to Kohler's box stacking and Series II to his use of implements. The four categories of response observed were *primitive* (such as simply reaching with the hand), *random*, *exploration and elimination* (characterized as the deliberate trying out of possibilities), and *immediate solution*. The primitive response tended to become less frequent as familiarization with the situation increased. Of all the responses, exploration and elimination were most frequent, followed by primitive responses and immediate solution, random responses seemed to be very infrequent. Four classes of outcome were found, as follows (the proportion of each is in parentheses) ⁵

- 1 Solution after immediate insight (33%)
- 2 Solution after gradual insight, either
 - A Partial (5%), or
 - B Complete (16%)
- 3 Solution after sudden insight, either
 - A Matured during exposure (14%), or
 - B Matured between exposures⁶ (4%),
- 4 Failure to solve (28%)

In relation to types of response, other than immediate solution, primitive behavior led most often to failure, but successes tended to be of the immediate variety, random responses were too infrequent for a tendency to be evident, and exploration and elimination were associated more often with successes than failures. Of the successes, gradual solutions with complete insight were most frequent. On this point, it is interesting to note that exploration and elimination led more often to solutions with sudden insight than did the other types of behavior. In general, Alpert found that the child's activity was determined by the nature of the problem situation. The same child would attack one problem in one way and another problem in a different way. Similarly, no one problem was solved in any one way by all the children.

The experiments of Matheson (44) and Ling (37) with nursery-school children yielded results very similar to those of Alpert.

⁵ There were some differences in incidence between the two series.

⁶ In solutions of this kind the subject may fail once or more and then apparently solve with ease the next time he is placed in the situation.

These excerpts suggest a number of very interesting points. In the first place, it is immediately apparent that the reports can be made to support a wide variety of interpretations. For example, it would be easy to overlook the preliminary behavior of the animal and to stress only the final solution, even more important, it would be easy to forget that each animal progressed through a protracted series of tests, during which acquaintance and skill with the problems and the materials were gradually built up. Furthermore, it would be easy to cite only the remarkable and successful feats of these chimpanzees, without giving proper attention to blundering or unsuccessful attempts to solve. In the second place, it would be a mistake to accuse Kohler of having attributed only insight to the behavior of his subjects, rather, he is concerned with stressing that their performance is frequently "intelligent." His reports, as the above excerpts show, actually give a faithful picture of far more varied behavior than the term "insight" has been taken to signify. Indeed, it will be clear subsequently that the data from human subjects in analogous situations include the same characteristics as those reported by Kohler. Thus if any evidence is needed, these excerpts demonstrate the need for adequate definition of terms.

In his studies with the young gorilla, Congo, Yerkes (61) employed situations and reported data very similar to those of Kohler's subjects. The monograph by Yerkes, however, is somewhat more satisfactory in reporting details of experimentation and in making clearer the sequence of stages in the ape's performance. For instance, it is readily apparent that Congo's insightful solutions seem to have evolved only after considerable preliminary learning—even, in many cases, to the point of careful demonstration by the experimenter. Of course, individual differences and differences between the species, and probably differences in methodology, need to be taken into account.

Utilizing similar problem situations, later investigators have repeated the experiments of Kohler and Yerkes, attempting to define the characteristics and incidence of insight, usually without paying adequate attention to the three aspects of the problem suggested above. Pechstein and Brown (47) compared the performance of a gorilla, chimpanzees, and children. They found that "learning never takes place immediately when the problem is, in reality, new." Immediate solution only occurs when it is possible to transfer what has previously been learned. The subject typically explores the situation and gradually develops appropriate responses. Insight, they conclude, should be employed "only to describe the fact of learning" and not to describe how the learning takes place.

In experiments with preschool children, Alpert (2) obtained some valuable quantitative data on the incidence of various kinds of behavior

- b* Pendulum problem The swings of a pendulum must be strictly regular. The duration of a pendulum's swing depends, among other things, on the pendulum's length, and this, of course, depends in turn on the temperature. Warming produces expansion and cooling produces contraction, although to a different degree in different materials. Thus every temperature change would change the length of the pendulum. But the clock should go with absolute regularity. How can this be brought about?
- 2 Mathematical problems
- a* 13 problem Why are all six-place numbers of the form 276,276, 591,591, 112,112, divisible by 13?
- b* Altitudes problem If the base points of the three altitudes of a triangle are connected by straight lines, the result is the triangle

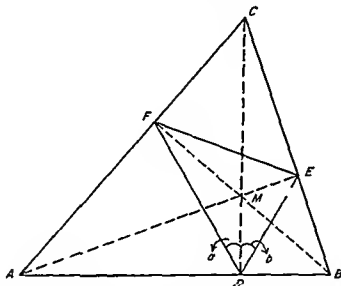


FIG 12 Geometrical representation of the altitudes problem (from Duncker, 14)

whose vertexes lie on these base points. Why do the altitudes bisect the angles of this triangle? Why, for example, does $a = b$ (Figure 12)?

Mechanical, or "tool," problems

- a* Gimlet problem Three cords are to be hung side by side from a wooden ledge ("for experiments on space perception") On the table lie, among many other objects, two short screw hooks and the crucial object—a gimlet
- b* Box problem On the door, at the height of the eyes, three small candles are to be put side by side (for "visual experiments") On the table lie, among many other objects, three little pasteboard boxes about the size of an ordinary matchbox, differing somewhat in form and color and put in different places

DUNCKER'S EXPERIMENTS

Another extensive series of investigations bearing upon insightful behavior has been conducted by Duncker (13, 14). His work has some special characteristics worth noting. In the first place, his primary concern was less with experimental data than with probing into the nature of the activity of his subjects. As a result, the experiments are often little more than illustrations or points of departure. In the second place, his analyses must be viewed in the light of his particular frame of reference. He linked problem solving ("productive thinking") with certain limited kinds of problem situations, and he was preoccupied with certain assumed conditions of performance. The situations upon which he based most of his analyses were practical "thought" problems. The conditions of performance which interested him were those associated with a "good" solution. For him, "insightful" signified "intelligent"—the degree to which an individual is able to respond effectively, *i.e.*, in a "good" manner, to relevant features of the situation. Within the limitations imposed by these two considerations—a particular problem situation and a particular kind of solution—Duncker has made extremely valuable contributions to our understanding of problem solving.

His method was to present a problem to the subject with the request that he 'think aloud'.¹ This procedure differs from classic introspection, since the subject does not analyze, or explain, or search for mental content, rather, he is supposed simply to verbalize what he is doing. Clearly, there are serious limitations with this procedure (Claparede, 9). The process of verbalizing may inhibit thought—it may slow the subject considerably, since speech may not be able to keep pace with thought. Other difficulties may be associated with differences between speech and thought, such as demands for greater coherence and orderliness in the former, and the greater 'privacy' of the latter. Nevertheless, there appears to be no way to avoid the use of this kind of method in collecting data on thought which go beyond the observable motor behavior of the subject. Well-trained subjects can avoid some of these hazards as also holds for introspection.

The following examples will illustrate the type of problem used by Duncker.²

1. Practical problems

- a* X-ray problem. How can one apply X rays, high intensities of which destroy organic tissues to cure a man of a tumor within his body (*e.g.*, in the stomach)?

¹ A similar method has been described in detail by Claparede (9).

² Hints were sometimes given during the course of solving.

of search and then an actual search for a solution to the problem. On the other hand, there exists the environmental situation of the problem, with properties which can be perceived more or less meaningfully by the individual, that is, the materials available, their arrangement, etc., signal their properties to the solver.

There are many conditions which facilitate or hinder signaling.⁹ Some of these have already been implied in Chapter 8, for example, factors related to the rigidity or flexibility of the subject. Others include the nature and efficiency of the individual's set, or model of search, and the extent to which his past experience equips him to respond to signals, *i.e.*, to perceive and recognize the properties of the situation. Duncker relates these factors to the character of the objects available for use, but his statements also take into account the dynamic relation between the individual and the external situation. The factors which may hinder efficient signaling are as follows (somewhat condensed).¹⁰

1 Lack of signaling. The model of search may be too vague or inadequate to lead to a perception of something which can be used.

2 Strength of attachment of some specific function to an object which must be used for some different function. This connection may represent a property which is seemingly the only function of the object, or it may represent the only function familiar to the individual.

3 Fixity of the required function. The individual may be able to see only one object as possessing the required function.

4 Necessity for altering an object. In order to fulfill the required function, it may be necessary to change, or modify, or reconstruct materials or objects at hand.

5 Original function actually given as a fact. An object may be present in the situation in its proper function, although it could be used in a different function.

6 Use of the same object for one function and later for a new function.

7 Poor suitability of an object for a new function.

If we keep in mind the considerations mentioned above, namely, that Duncker was concerned with particular kinds of problems and that he viewed problem solving as a matter of successively reformulating and varying the elements of a situation, the point becomes clear. In order to solve a problem, it is necessary to utilize objects in new ways or to reorganize the elements of a situation. The problem is analyzed to see where the trouble lies, what needs to be done, and what is available for solving.

⁹ Or, in gestalt terms, the signal may be more or less *pragmatic*.

¹⁰ This formulation represents the present author's interpretation of Duncker.

These examples show how important it is to keep in mind the kind of problem situation upon which interpretations are based. The problems given above are of a highly rational kind and in some instances, at least, require specialized skills for their solution. The mechanical, or tool, problems, especially, appear to be designed to promote the kind of solution in which Duncker was interested.

From his protocols, Duncker concludes that the process of solution has two aspects, (1) analysis of the situation and (2) analysis of the goal. In achieving a solution, the subject must ascertain the conflicting elements of the situation, since, according to Duncker, the solution always requires some variation of crucial relationships. It is also necessary to analyze the materials available in order to resolve the conflicting element, that is, to remove the difficulty. Thus the subject looks over the situation to determine where the trouble lies and tries to find out what can be used to remove the difficulty. The individual also, in a "genuine" solution process, analyzes the goal, that is, considers what must be done if the solution is to be achieved. These aspects of dealing with the problem are called by Duncker "heuristic" methods, they represent ways in which the subject can, and does, attain solution.

Solutions achieved by analytic means are regarded by Duncker as rational and desirable, contrasted to "solutions through resonance," which he regards as banal and less rational. "Resonance" is "the process by which in the perceptual field or in memory an object or a situation is sought out through specific signaling" (14, p. 75). He suggests that resonance effects may participate wherever previous experience, or learned structures, are included in the solution process. Since it is difficult to conceive of problem solving without the participation of previous learning, we may simply say that, in Duncker's view, resonance signifies the perceptual cognitive manner in which the present problem situation is linked to previous experience. When the subject is presented with the instructions, past experience comes into play through the arousal of the traces corresponding to the properties contained in the instructions. As a result, the subject will set up "models of search," or general schemes to guide the application of previous experience in the present situation.

Resonance comes into play as aspects of the situation "signal" to the solver. Thus the perception of what is demanded will suggest, or signal, relevant possibilities to the subject. Or objects available for use in the solution may signal their properties to the solver. In this way, Duncker appears to recognize an interplay of factors between the individual and the problem situation. On the one hand, the solver internalizes the instructions (or their equivalent, the perception of a problem situation), and this is followed by the more or less clear formulation of a model

worked out by Duncker, but Wertheimer has clarified them and penetrated further into them

Productive problem solving, in Wertheimer's view, depends upon an understanding of the structural and functional relationships of the situation. In a sensible solution, the individual must grasp the meanings, the principles, the *inner relations*, of aspects of the situation. This is not to say, either, that just *any* relations are fruitful or that parts of the situation can be separated from one another. Rather, the entire process depends upon grasping and utilizing the essential requirements of the problem, and it rests upon an orientation to the whole problem.

But there is a still more fundamental requirement. The solution depends upon a grasp of the particular, inner relations and an orientation to the structural requirements of *this* problem. It is not a matter of the mechanical application of rules or principles—not just the blind application of operations which have worked before. The solution grows out of an understanding of the specific requirements of the immediate problem. Thus productive thinking consists in “envisaging, realizing structural features and structural requirements, proceeding in accordance with, and determined by, these requirements” (59, p. 190). By getting at the fundamental nature of the problem, the individual is in a position to do something which will satisfy those requirements. Instead of struggling to cope with the situation in a habitual, mechanical, “blind” manner, the individual can construct, or reconstruct, or reorganize features of the situation in accordance with the inner relations of the problem as a whole. Problem solving, in this way, is conceived to be a dynamic, fluid process.

There are, perhaps, two main dynamic considerations. In the first place, the process starts with perception of the situation, of the problem, which results in a *centering* of attention upon the essential elements of the problem and their relation to the basic difficulty. In order to solve the problem, there must be some reorganization of the elements or some modification of already known principles, with a resulting *recentering* of attention. Without the initial penetration to the real difficulty, and without appropriate changes in attack or concepts or principles, the individual could never solve problems, except by accident or unless each successive situation were identical with each preceding one. In short, a rule or a concept is of no practical use unless it is fully understood.

From the psychological standpoint, centering sets up in the individual tensions which lead him to attempt to satisfy the requirements of the problem. The tendency will be to achieve the most satisfactory solution possible (*pragmancy*). If recentering leads to a satisfaction of those requirements (to closure), then a successful solution has occurred.

it To be sure, the solution may occur immediately, if a simple perception of the problem locates the difficulty and there is readily available the means for dealing with it For instance, if I need to hang a picture, all I need is a hammer and a nail, I go to the toolbox and get the equipment Such a solution would be a simple matter of resonance On the other hand, no hammer and nail may be available, in this case, there is a real difficulty, which might be solved by wedging a small strip of wood into a crack in the wall and hanging the picture on this improvised peg Such a solution involves *recentering*, in which an alteration occurs in the properties of an object or in the object itself Thus in the example given, the strip of wood has to be seen as a possible peg, a new function for it, and the crack has to be seen as a peg hole, a property not immediately associated with cracks

The seven factors listed above thus express conditions which hinder recentering They emerge very clearly in Duncker's experiments (and in others, also, cf 7, 16) and have a wide and important pertinence in the problem situations of everyday life

It would be valuable to subject the factors in recentering to further experimental investigation, with an effort to obtain objective and quantitative data The problem situations in which they apply need to be defined clearly (see also their pertinence to Muer's work, especially 41) Indeed they could easily be converted into very useful rules to apply in problem situations ¹¹

WERTHEIMER'S STUDIES OF PRODUCTIVE THINKING

Duncker owes much to Max Wertheimer, who led the way to the concept of recentering in problem solving Since Wertheimer's little book, *Productive Thinking* (59), represents the culmination of work on insight, we shall conclude this aspect of problem solving with a brief indication of his formulation

Like other gestalt psychologists, Wertheimer has taken as his principle concern the factors contributing toward and the processes occurring in, "sensible" solutions In this respect, his work is a very valuable contribution to pedagogy ¹² In the present connection, his book is important because he has placed the whole matter of problem solving on a dynamic basis It is a discussion of what actually does occur in successful problem solving The fundamental principles involved are similar to those

¹¹ That is they could be incorporated into the model of search

¹² Katona's work discussed in the last chapter has a similar significance (32) And see Helson and Helson (24) who have discussed Wertheimer's principles in relation to the improvement of the teaching of mathematics

which we drew above. The work of Duncker and Wertheimer, especially, has illuminated the nature of what we may call "insightful" behavior,¹³ i.e., that which depends upon understanding the relations within the task and utilizing the materials in a highly controlled, rational manner. Their analyses are limited by their emphasis on particular kinds of situation, which have these properties: (1) the goal can readily be perceived, (2) the subject must discover, basically through symbolic means, some novel relation or use of materials, and (3) the whole task can be perceived prior to solution. From their work, it is clear that insightful behavior characteristically leads to a good solution, and they have revealed the characteristics associated with insightful performance. On the other hand, they do not exclude noninsightful behavior, which is that behavior which fails to lead to a good solution. Nor do they exclude what we call "trial and error," partly because of the limitations of their problem situations, partly because it may accompany insightful performance. In this latter connection, they simply would stress the insight features if they predominate, and regard the trial and error as largely peripheral behavior.

By implication, these studies bear upon insight as a mode of attack,¹⁴ for it would be an approach in which the individual deliberately seeks understanding of the inner relations in the material or strives to analyze the conflict, the goal, etc. The limitation here is that they have singled out for description only certain kinds of performance, in consequence, we cannot conclude that this is the typical mode of attack or even that other modes of attack might not be equally good, or better, in appropriate situations. In short, the linkage of "insightful" with "intelligent" appears to signify that the only genuine mode of attack is insight.

Finally, with respect to insight as a kind of solution¹⁵ there is now ample evidence, especially from the studies of Kohler, Alpert, etc., that sudden, confident, complete solutions can and do occur. However, they are not the only kinds of solution, nor are they necessarily possible in all cases. It is not necessary, therefore, to choose a particular pattern as the one most typical of problem solving behavior, for there are many patterns. The one displayed by the subject depends upon the nature of the situation, the subject himself, and what the experimenter is looking for.

It will be our task in the next section to survey human problem solving in a broader perspective, in an effort to clarify these patterns and their interrelationships.

¹³ Usage 1 p. 166

¹⁴ Usage 2 p. 166

¹⁵ Usage 3 p. 166

Finally, a word about Wertheimer's interpretation of some familiar psychological problems. With regard to the role of past experience, Wertheimer points out that he does not belittle its importance, as some exponents of "insight" have appeared to do. On the contrary, he believes that it plays a large role. "What matters is *what* one has gained from experience—blindly understood connections, or insight into structural inner relatedness. What matters is *how* and *what* one recalls, how one applies what is recalled, whether blindly, in a piecemeal way, or in accordance with the structural requirements of the situation" (59, p. 62). It would be easy to conclude that past experience is of no significance if the individual is unable to solve a problem. On the contrary, in failure, too, past experience is actually of great importance, since it may have failed to equip the individual with the kind of understanding necessary for grasping the inner nature of the problem and an understanding of how a principle can be adapted to it. By the same token, the individual may have learned in the fluid, dynamic manner described by Wertheimer, with the dual consequence that he understands what he is learning and that he knows how to apply it.

The same kind of consideration applies to attitudes, ranging from those pertaining to problem situations in general to social values and the like. Such attitudes as the product of past experience, pertain to how the individual will regulate his behavior in a problem situation.

Wertheimer is equally cognizant of the importance of practice. "Repetition is useful, but continuous use of mechanical repetition also has harmful effects. It is dangerous because it easily induces habits of sheer mechanized action, blindness, tendencies to perform slavishly instead of thinking, instead of facing a problem freely" (59, p. 112). As in other connections, therefore, Wertheimer is arguing that practice may be harmful or useless, unless it is the kind of practice which will facilitate centering and recentering in future situations. Implicit, again, in the gestalt view of the role of practice is an interest in effective, or "good," thinking. There can be no doubt that, despite dangers, practice is essential in learning and thinking.

CONCLUSIONS WITH REGARD TO INSIGHT

Perhaps the single most important conclusion to be drawn from the foregoing studies of insight—as from those of transfer of training—is that the efficient management of a present situation depends upon the development and application of modes of attack or appropriate sets. That is, relationships, principles, attitudes, methods, etc. are more significant than specific content, or specific operations, or specific rules.

The studies which have been made of insight support the distinctions

Recognition of the Problem Although this process is usually more or less assumed by the experimenter, as shown, for example, in careful and clear statement of instructions, it often appears in the subject's verbalizations. He may repeat the instructions in some way, or he may, so to speak, rationalize what he has to do by saying that he will do what the experimenter requests, etc. Many other ways in which the individual identifies and accepts the problem situation (apart from the particular difficulty involved) are evident.

Manipulation or Exploration of Some Kind This behavior is invariably found, especially, of course, in those tasks in which familiarization with the materials is essential before the nature of the problem can be fully realized, or where more than one "lead" may result in progress. Except for repetition of identical problems or in very easy and familiar situations, this behavior appears to be a *sine qua non* of solution. Often, of course, manipulation or exploration may occur at a verbal or observational level, prior to any actual overt movements.¹⁶ Sometimes manipulation or exploration may be of a random sort, without any evident purpose other than to deal with the materials, at other times, it may be of a deliberate sort, to the end of testing out successively various possibilities.

Analysis. Another characteristic usually noted is that the subject attempts to formulate the goal or the problem, or to work out the nature of the difficulty. Apparently, there are wide variations in this behavior, ranging from a highly controlled, rational extreme to a more generalized, less deliberate extreme.

Partial Solving. This process, or mastering parts of the problem before the final solution, is another common aspect of performance. There are many problem situations where partial solving is essential to the final solution, as when a certain move will clarify the principle demanded, or where the final pattern can be found only as a result of prior sub-solutions. Again, except in simple situations, or in those in which the entire solution depends upon the application of a single principle, the solving of successive steps appears to be an integral part of the performance. Often to be sure, some of the intermediate steps may be omitted.

Emotional Responses Finally, the occurrence of these responses must be regarded as a characteristic of problem solving. That is, emotional responses accompany the other responses evoked by the successive aspects of problem solving. The experimenter may regard the emotion as incidental to the behavior that he is interested in recording. Nevertheless, the initial presentation of the problem, the activities of working toward the solution, and the solution itself are usually associated with varying

¹⁶ This behavior has been called "vicarious trial and error."

HUMAN PROBLEM SOLVING IN GENERAL

Several studies of problem solving with human subjects have been more neutral in their approach than those previously discussed. It might be said that the investigators have simply exposed their subjects to problem situations, without the intention of looking for any particular behavior, and have attempted to record everything that took place. Inevitably, there results a great mass of data, largely qualitative in nature. It is difficult to systematize material of this kind, but in the present stage of our knowledge, there appears to be no more simple approach to a general understanding of problem solving.

The typical procedure in such experiments is to present a problem to the subject, who is requested to carry out his thinking aloud. Usually, the experimenter also seeks to obtain introspective evidence, *i.e.*, the subject may be asked to analyze how and why a certain step in the solving occurred to him, or the experimenter may have the subject retrace his performance after it is completed in order that elucidation of what occurred may be obtained, with the advantage that the subject may better relate his performance to the whole problem. As a rule, the experimenter also observes the subject's overt behavior, noting, for example, manipulations of the material, emotional responses, etc. At the end of the session, the experimenter attempts to fit into a coherent pattern the course of thinking as reflected in the verbalizations, the overt movements, and the subject's additional introspective interpretation of what transpired.

So many different kinds of situation have been employed that conclusions about typical aspects of behavior may be based on a variety of problems. One of the most popular types of situation is the mechanical puzzle (50), in which manipulation is required for solution. Another variation is the construction puzzle (15), in which pieces must be fitted together to form a figure or pattern. Practical, or "thought," problems (7), similar to those of Duncker, have also been used, in this case, the subject may be required to apply a physical principle or supply the missing word in a stanza of poetry, etc. In other experiments, problems in plane geometry (25) and anagrams (51) have been employed. Experiments on concept formation, such as those of Heidbreder (22), discussed in Chapter 7, also represent a kind of problem-solving situation.

The protocols obtained from subjects in such situations characteristically reveal many different processes, which may go on successively or simultaneously. In almost any problem, at least some of the subjects display all these processes.

inctions in their analysis which contain important implications for future research In the first place, they arranged the conditions in such a way that opportunities for *ideational* solution preceded the actual *manipula-*

Trial and error	Insight*	Gradual analysis
General behavior Blind groping	Groping suddenly stopped	No groping but a gradually developing understanding
Character of understanding Hindsight	Sudden foresight	Foresight
Emotional characteristics Confusion till the last moment Hopeless feeling	Confusion suddenly cleared Excitement elation some times relief	Cleared step by step Satisfaction
General set or attitude To match pieces Attention to goal distant diffuse Attitude not definite but wandering haphazard	To look for wholes or inter relations Attention not centered on goal Passive receptive	To satisfy goal needs Attention concentrated on specific goal needs Active directed search
Intermediate characteristics Error curve irregular may not drop out after solution transfer poor Manner baffled	Curve irregular then sudden drop transfer good Baffled then suddenly well organized efficient	Error curve steplike transfer good Calm well organized

* We are employing the term insight instead of sudden reorganization to accord with the discussion elsewhere in this chapter

true solution In the first stage, some of the essential materials were omitted and the children were asked to propose a method to solve the problem, in the second stage, the missing materials were supplied and the children tried again, finally, the children were permitted to solve the problem physically This method of dealing with problem solving should be used more extensively Their second distinction is between "realistic" and 'unrealistic' solutions A realistic solution is one which deals with "objects and relations in the situation as given, without seeking far afield for the solution by means of radical alterations in the situation presented (p 320) An unrealistic solution "depends on objects or forces remote from the situation as presented and [is one] which requires extensive and, at times fanciful changes in the problem situation" (p 320) Here again

emotional reactions, as well as with manipulation, the formulation of hypotheses, etc. For instance, it is typical for the subject to experience disappointment, annoyance, anger, etc., when the difficulty is not immediately overcome and to feel satisfied, delighted, relieved, etc., when progress is made or the solution found.

Putting all these processes together, we may say that human problem solving consists most typically of the following processes: apprehension or recognition of the problem, together with effort to deal with it, some manipulation or exploration of the situation, some degree of control, or direction of performance, the understanding or mastery of intermediate requirements or steps, and emotional responses representing some degree of personal involvement in the situation.

The particular ways, however, in which this behavior manifests itself is related to the kind of approach which the subject makes to the problem. It has been found that individuals differ in their *modes of attack* on the problem, i.e., the foregoing processes occur in different patterns. Among the clearest formulations of these patterns are those of Ruger (50), Durkin (15), Biber *et al* (3), and Sargent (51).¹⁷ Of these, Durkin has described three modes of attack in detail as shown in the table on p. 183.¹⁸ It is apparent from this table that all the general characteristics mentioned above are found in all three modes of attack, but in different ways and in different degrees. Actually, as Durkin points out, these modes of attack should not be regarded as mutually exclusive, rather, they represent abstractions from a continuum of performance. The mode of attack may change, for example, within the course of solving a single problem. Transitional behavior is also observed where, for instance, the subject combines aspects of trial and error with aspects of gradual analysis, or aspects of insight with aspects of gradual analysis, etc.

The experiment of Biber *et al* (3) with 7-year old children also reveals these patterns of behavior. They employed problem situations of the type devised by Kohler and Alpert (a multiple stick problem) and by Duncker and Maier (pulley, lever, and water level problems). Both complete and partial solutions occurred, but most were of the latter variety, that is, the solution appeared rather gradually, following exploration and manipulation. These investigators make two further dis-

¹⁷ Heidebreder's formulation of processes occurring in concept formation has many points in common with the findings of these investigators (22). Thus her participant behavior corresponds in part to trial and error and in part to gradual analysis and her spectator behavior corresponds essentially to insight. Her treatment is especially good in showing that such aspects are not necessarily sharply distinct from each other but rather various kinds of behavior interplay.

¹⁸ Although she chooses to call them types of solution, they are most meaningfully to be regarded as modes of attack.

were defined much more narrowly than in this chapter and included nine aspects of approach, as follows: clear formulation of the problem, preliminary survey of material, analysis into major variables, location of crucial features, application of past experience, varied trials, control, elimination of sources of error, and visualization.²⁰ Using three simple but contrasting problems, he found that the occurrence of a particular method depended upon the task, and that the efficacy also depended upon the nature of the problem. His tasks, however, are too few in number to supply satisfactory answers to the questions suggested above. Furthermore, his analysis is in terms of methods rather than individual patterns. He gives insufficient data on the course of the solving process to permit the statement of relationships between kinds of method and kinds of solution.

THE IMPORTANCE OF SET

Although we shall deal more extensively with the regulative systems in thinking later (see Chapters 13 to 15), it is pertinent to mention them briefly here. The work of Maier (39-41, 43), especially, has emphasized their role in problem solving. He has pointed out that, in addition to relevant past and present experience, motivation to solve, analysis of the situation and materials, and the other aspects of problem solving, the individual must also have "direction" in his behavior. In the experiments previously discussed, direction has certainly been implied.²¹ Presumably, such directions may be developed by the individual as a result of observation and analysis of the problem or from understanding of the difficulty or goal. Nevertheless, Maier's experiments are especially dramatic since they demonstrate that there may be situations in which it is unlikely that the individual can spontaneously develop appropriate direction, no matter how much he knows about the separate requirements of the problem or how free he is to analyze the problem, the materials, and the goal. Thus even insightful behavior must be guided by an adequate set, which will serve to integrate the elements of the problem and relevant experience and to guide performance to the goal.

This principle has been demonstrated by Maier in a series of rather difficult problems. Perhaps the best known of these is the pendulum problem (39). The task was to construct two pendulums, each of which would swing over a designated point on the floor. Various materials were available to the subjects, including coils of wire, two kinds of clamp, chalk,

²⁰ It would be valuable to ascertain the degree to which various of these 'methods' characterize the three broader modes of attack defined in this chapter.

²¹ Duncker (14 pp. 15-17) believed that the concept of direction is unnecessary, since it is implied in the subject's formulation of the problem in analysis etc. However, in the judgment of the present author, the role of regulative systems is so important that it must be explicitly stated. The terms used are immaterial.

is a variable in problem solving which merits greater study. Most experimenters appear to ignore it, perhaps because they have been so engrossed with the strict limitations established by their plan of investigation—or they may have regarded unrealistic attempts at solution as part of exploratory behavior

If we follow Sargent's suggestion and distinguish modes of attack from kinds of solution, the picture of human problem solving in experimental situations is completed. The data suggest that at least four kinds of solution may occur. An *immediate* solution is one in which the subject requires no intervening steps but at once arrives at the solution. A *gradual* solution is one in which the goal is achieved only after a succession of activities and with only a minimum understanding of how it was attained—or perhaps it may occur only by accident. A *steady* solution is also one which follows after a succession of activities, but these are well understood as they occur, with a good final understanding of how the solution was attained. A *sudden* solution is one following a succession of activities but in which the solution is attained by omitting further steps and leaping at once to the final solution. As in the case of modes of attack, these kinds of solution are not always sharply different from each other, for transitional forms of solution may occur. For example, a sudden solution may not be accompanied by full understanding of how it was attained, or a gradual solution may be accompanied by partial understanding.¹⁹

It is a good question whether the kind of solution is linked with a particular mode of attack. It does not appear to be a necessary relationship. For example, trial and error may lead on some occasions to a sudden solution, or it may lead to a gradual solution. Gradual analysis may lead to a steady solution, or it may lead to a sudden solution. Insight may lead to an immediate solution, or to a sudden solution, or sometimes to a steady solution. The possibilities are complicated still more by the fact that the mode of attack may shift during the course of solving. It is especially with regard to the question of this relationship that quantitative data are needed. It should be possible to ascertain to what extent an individual maintains the same mode of attack in a problem situation, and with what frequency a particular mode of attack leads to a particular kind of solution. As an extension of the question, it would be valuable to know how consistently a particular person employs a given mode of attack or attains a given kind of solution.

Questions of this kind have been raised by Burack (8), who sought to determine differences in the use of various "methods of attack." These

* Bulbrook's (7) data admirably illustrate all these points and others made in this chapter. Perhaps one reason is the wide variety of problem situations in which her data were obtained.

and experimental problem. Then, following a second presentation of the control problem, the lecture and suggestions were given, after which the subjects again attempted the experimental problem. In both experiments, there were many more successful solutions when the suggestions were given.

Other investigations confirm the general nature of Maier's conclusion. The detailed work of Claparede (9) was concerned, basically, with the origins and functions of directing and controlling factors in thought. He concludes that even trial and error behavior does not occur in an uncontrolled fashion, although the formation of regulating mechanisms, or hypotheses, may take place at an unconscious level. Ewart and Lambert (17) showed that more adequate instructions result in a decrease in the number of trials and excess moves required to solve a problem. Hildreth (27) demonstrated similar results with children. Luchins (38), for a variety of tasks and for subjects ranging from elementary-school pupils to adults, had an experimental group write "Don't be blind" on their papers before he presented critical problems, solvable by a more direct method than that which had prevailed in preceding problems. Under these conditions, the experimental group were more likely to discover the more efficient method. In later critical problems, the experimental group were much more efficient, because the control group tended to persist in their attempts to solve the problems by the earlier procedure.

Although it was designed to test a theoretical point in learning theory which there is no need to discuss here, an experiment by Prentice (48) may also be interpreted as revealing the fundamental importance of direction. His subjects were given the task of learning a rather difficult visual discrimination. The stimuli consisted of pairs of circles and squares, each of which presented a choice of size, color (white, black, and dark gray), and shape. A choice was made by pressing one of two telegraph keys, marked respectively with a circle and a square. A correct response turned on a light, and a buzzer sounded for a wrong choice. The circle key was correct for *any* figure with a dark background which appeared on the subject's right, the square key was correct in all other cases. One group of subjects was simply exposed to the problem, but another group was first given 20 trials in completely reversed fashion, that is, the buzzer rang for correct responses, and the light went on for incorrect choices. Thereafter, the pattern was the same for both groups. These first 20 trials occurred *before* there was any evidence that the subjects were mastering the problem. Nevertheless, the experimental group required much longer to achieve the criterion of 12 successive correct choices—in fact, about 20 trials longer. Evidently, something is gained during periods of sheer exposure to the parts of a problem which is essential to ultimate success.

and lengths of wood. The solution involved three part responses, (1) suspending the chalk at the end of a wire by tying the wire to a clamp which held a piece of chalk, (2) making a pole long enough to reach the ceiling by clamping together two lengths of wood, and (3) supporting the two pendulums at either end of a board by wedging it against the ceiling with the long pole. The necessary direction was a statement of the fact that the problem could easily be solved if the pendulums could be hung from the ceiling. Five groups participated in the experiment,²² as follows

Group 1 Problem only (control)

Group 2 Part solutions demonstrated by analogous means, but not presented in relation to the problem

Group 3 Part solutions demonstrated and related directly to the problem, *i.e.*, it was said that they *are* the solution in separate parts

Group 4 The direction was given, after the problem was presented

Group 5 Same as group 3, plus the direction

The subjects displayed six different types of solution, five of them unsuccessful, such as achieving one of the part solutions without discovering how to complete the structure and building up from the floor (*e.g.*, building a tripod)

Of 62 subjects in the first four groups, only 1 achieved the correct solution, whereas 8 of the 22 in group 5 achieved it.²³

In other experiments, Maier has further shown the importance of direction (41). For instance, an experimental group was given a twenty-minute lecture on problem solving, followed by a summary of general hints on how to reason. The hints suggested that it is necessary to vary one's attack on the problem and that new combinations should be sought when previous attempts have proven unsuccessful. A control group did not have the lecture or hints. Since it was possible that the two groups may not have been equated in ability to begin with, a subsequent experiment was designed to test the same group on both control and experimental problems. In this case, the subjects were first tested on a control

²² Not all the data were obtained at one time for the five groups were first tested at the University of Berlin, and additional subjects in groups 3, 4, and 5 were later tested at the University of Michigan. The two sets of data agree.

²³ Weaver and Madden (58) have repeated the pendulum problem with somewhat equivocal results. When the data were classified according to Maier's specifications only four solutions were obtained from 54 subjects. Including another variation of the correct solution the group given the parts (group 3) made about as many correct solutions as did group 5. Otherwise Maier's results were confirmed. Further analysis showed slightly more advantage for group 5, *i.e.* more subjects attempted the correct solution. Actually direction appears to operate also in group 3.

general ability or function Nevertheless, in Billings's own study, there was little difference between men and women in IQ, although the men scored higher on the problems Does this mean that a breakdown of the test items would show that the men's IQs depend more upon reasoning items and less on others?

Heidbreder (23) found that the general ability to solve problems increases with age and attempted to analyze the differences among subjects of different ages Two of them, she suggests, are increased responsiveness to the problems, as such, and a gradual emergence of more definite modes of procedure, in short, there appeared to be a gradual change from less adaptive to more adaptive modes of response, from more subjective to more objective attitudes toward the problem Whether these changes result from intellectual changes or simply from learning was not ascertained, however It is very significant to note that, in any case, 'the total reaction involved in solving problems is recognizably present in four-year-old children To be sure, it appears in an inchoate form The problem set is wavering and insecure, reasons are infrequent and are limited in variety, likes and dislikes, and the personal and social aspects of the situation loom large at the expense of matters more relevant to the problem itself

We are left with the same conclusion that we found in relation to concept formation At present, our knowledge of the relation of mental processes to age and intelligence is extremely inadequate It is quite probable that our present intelligence tests are only of partial aid in predicting problem solving performance

✓ 2 Conditions of Work Since problem solving involves transfer, what has been said in the preceding chapter also applies here We shall not reiterate those conditions but instead mention some additional considerations Cook (11) found that massed and distributed practice have differential benefits for different stages of the solving process The former was more efficient in the early stages, but there was little difference for later stages Retention, after several weeks, was better for distributed practice These findings may have some relation to modes of attack For instance, early massed practice may facilitate exploration and analysis of the materials whereas later distributed practice may facilitate variation in the event that difficulties need to be overcome by a new approach or by recentering

Experiments such as those of Davis (12), Shaw (52), Clites (10), and Bills and Stauffacher (5) suggest that bodily conditions are related to problem solving In general, the muscle-action potentials which accompany mental activity (see Chapter 5) show variation with the nature of the problem For example, they increase in magnitude as problems in-

even if it cannot be tangibly identified (*e g*, through introspection) Until further research clarifies the phenomenon, it may be accounted for in terms of the gradual development of direction In the case of Prentice's experiment, the complexity of the task apparently made it very difficult not only to evolve appropriate direction but also to ascertain wrong direction

The general conclusion to be reached from experiments of these kinds is that the subject's set is an important aspect of problem solving Without an appropriate set or direction, solutions cannot be attained, except by accident, and the ease with which the individual can evolve the direction for himself varies widely

OTHER FACTORS IN PROBLEM SOLVING

It may be remarked that the role of problem solving in the general behavior of the individual has as yet, hardly been investigated That is to say, experimenters have been so absorbed with the basic processes occurring in rather narrowly defined situations that these processes have not been adequately related to other aspects of behavior This state of affairs is not at all surprising in view of the enormous complexity of problem solving and the great difficulty in obtaining clear and objective data A few valuable indications of future possibilities nevertheless exist We shall confine ourselves to those data specifically directed at problem situations, although the literature of psychology contains a great many other suggestions which could equally well be utilized The variables to be considered fall under three headings

1 Age and Intelligence At the present time, very little is actually known about the relation between problem solving and increasing chronological age, whether considered from the standpoint of kinds of performance or of ability to achieve correct solutions In this respect, as was noted earlier in relation to concept formation, it does not seem to be true, necessarily, that performance depends in a simple fashion upon either chronological age (CA) or mental age (MA)

The experiments on children (2, 42, 44) show that there is a positive correlation between successful solutions and increasing CA and MA, but these correlations are surprisingly low Is it because performance depends largely upon the methods of instruction which pervade the educational system? Is it because of differences in personality development (see rigidity-flexibility, Chapter 8, and below)? Is it because our intelligence tests do not adequately measure problem solving ability? These and many other questions remain to be answered

Billings (4) has shown that there are high correlations among abilities to solve problems in different fields and believes that problem solving is a

exists, to intellectual, emotional, and motivational factors. Either or both of two methods might be used. On the one hand, individual case histories might be compiled to determine whether a person is usually characterized by a particular pattern of thinking, or in what situations he typically thinks in a given manner; this approach would direct itself to the discovery of consistencies and efficiencies of thinking. On the other hand, a more obviously correlational method could be used to see whether definite patterns of thinking exist, that is, whether a given mode of attack is usually accompanied by a given quality and amount of transfer, more or less concrete or abstract use of concepts, etc.

A preliminary effort to employ a kind of case study to study thinking has been reported by Bloom and Broder (6). Their principal interest was the practical one of remediation of problem solving among college students. They point out that problem solving is frequently described in terms of the product, or solution, rather than the processes leading thereto. A potentially useful procedure was developed to discover the patterns of thinking characteristic of individual students and to instruct them in better techniques. Bloom's and Broder's comparatively restricted approach to problem solving could well be broadened to include many of the suggestive experimental findings discussed in this chapter.

CONCLUSION THE STAGES AND CHARACTERISTICS OF PROBLEM SOLVING

Human problem solving begins when the individual is confronted by an obstacle, or a difficulty, or a novel task. Once the problem is recognized, or it is recognized that there is a problem, the individual who seeks to solve it displays behavior which we have called manipulation and exploration, analysis (or a more or less directed attack), mastery of some aspects of the problem as activity proceeds, and emotional responses.

We have drawn a distinction in such behavior between insightful and blind activity. The former is that which is marked by understanding, or search for understanding, of the requirements of the problem; whereas the latter is mere fumbling without much understanding or search for understanding. Probably most human problem solving is insightful rather than blind, yet either or both may occur in any one solution process and in any individual in some situations.

We have drawn a further distinction between mode of attack on the problem, within the framework of which the above activities occur and the kind of solution attained. Three principal modes of attack have been formulated and roughly outlined namely, trial and error, insight, and gradual analysis. A mode of attack may lead to one of four kinds of solution—immediate, gradual, steady, or sudden. These modes of attack and

crease in difficulty (12, 52) Winking rate increases in successful solving (10), and tension is beneficial in easy problems and detrimental in hard problems (5) There is some evidence in the latter case that the effects of voluntarily induced tension depend upon the nature of the problem

Sargent (51) has compared performances on tasks of varying difficulty He found that individuals differ considerably in their ability to solve easy and difficult anagrams Subjects who dealt best with the easy prob-lems were marked by speed of immediate reorganization and effectiveness in reacting to perceptual cues Those who were efficient with the difficult words were characterized by most of the following effectiveness in react-ing to cues hit upon during trial and error, ability to limit hypotheses, use of analysis based on past experience, versatility in setting up hypotheses susceptibility to interference or blocking and susceptibility to perseveration Some persons were good in all these ways and hence efficient with both easy and difficult words, others were poor in all these ways and hence generally inefficient, but still others were good in those ways promoting success at one level of difficulty but not at another These conclusions are based on introspective protocols, and one would like to have more objectively defined evidence, which should not be difficult to obtain In any case, this study is very suggestive, since it indicates that different degrees of difficulty require different kinds of performance, and that individuals differ not only in ability to solve but in the kinds of problem with which they are most successful

3 Personality and Emotional Factors Robinson (49) has shown, in an ingenious experiment, that varying degrees of confidence, or assurance of success, are related to the amount of time spent on a problem, and that persistence along a given approach becomes less as the number of altern-atives increases Szekely (53) has shown some of the emotional factors which interplay during the course of solving For example, when a stage of performance appears to be productive, emotional components become more directly effective in relation to the solution

Such studies emphasize the need for additional investigation of these relationships We can well support the suggestion of Johnson (31) that "it would be worthwhile to study the relation between individual differences in thinking and other personality variables"

In fact, the more thoroughly one penetrates the problems of human thinking, the more important it appears to extend investigation into what might be called the 'case study of thinking' Such an approach would undertake to collect and interrelate as many aspects of performance as possible in as many situations as practicable The patterns which emerge, if any, do could be analyzed for their major characteristics, e.g., mode of attack, perceptual traits variability, etc., and related, if any relationship

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solutions should be regarded more as convenient categories than as mutually exclusive. In a given process of solution, more than one mode of attack may be utilized, and there are many possible intervening or transitional forms.

The greatest need at the present time is an experimental approach, in a broad frame of reference, to interrelate these aspects of problem solving in a variety of situations and to relate them to other mental processes and to personality variables.

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Chapter 10. IMAGINATION

In this chapter and the next, we shall deal with images, free play, fantasy, dreams, and wishful thinking, *i.e.*, with mental processes which are relatively free from, and slightly determined by, the realistic demands of the accompanying environmental situation. As suggested above (page 160), it is most understandable, in attempting to systematize the enormous complexity of thought, to treat it as a bipolar process. So far, we have concentrated on the realistic pole, that which occurs in situations where external stimuli are paramount or where the individual, regardless of his internal need state, is strongly influenced in his response by outer conditions. Traditionally, the realistic pole has been called "reasoning", in psychology, this term has been converted for the most part into "conceptualizing" or "problem solving". It is now necessary to discuss thinking from the standpoint of the opposite pole, that of the internal need conditions of the individual. Traditionally, this pole has been called "imagination". It includes the phenomena of images and many kinds of play and may be systematically observed in responses to projective tests, these aspects will be considered in this chapter. Fantasy, dreams, and wishful thinking will be taken up in the next chapter.

Certain problems of language suggest themselves. In the first place, the term "realistic" is likely to make trouble. In the present connection, it does not signify "right" or "true," nor does it signify "useful," or, necessarily, "intelligible" (or "intelligent"), or even "conscious". It may, of course, be associated with all these conditions, in fact, it is doubtless more likely to possess these characteristics than is imaginative or autistic thinking. However, all that is meant here by "realistic" is in touch with, or directed toward, the external world, or determination by external conditions. It contrasts therefore with adjectives which signify out of touch with the external world or determined by, or directed toward, the internal activities, impulses, needs, and processes of the individual. We shall use the word "imaginative" for these latter conditions.

There is ample evidence to show that thinking is never entirely one or the other, neither completely realistic nor completely imaginative, rather, there may be extreme occasions when thinking is dominantly realistic and other occasions when it is dominantly imaginative. For example, solving number series would usually be primarily realistic, whereas dreams would usually be primarily imaginative. Most of the time, however, thinking is

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acteristics distinct from a perceptual response to a present stimulus (42)

(1) Images are fainter, less detailed, less definite than immediate perceptual responses (2) Images are unsteady and fleeting, since they represent the recurrence of previous experience, they cannot supply new factual information about an object or situation, although new relationships may be experienced by the manipulation of images In perceptual response, on the other hand, where the individual is actually in contact with the present environment, new information can usually be obtained by continued examination of objects (3) Images are facilitated by shutting out external stimuli, as by shutting the eyes or closing the ears, thus increasing the dominance of previous experience (4) Images need not correspond to actual, real objects and, in fact, frequently represent bizarre, unusual, distorted, exaggerated, incomplete, or otherwise modified or combined impressions of external objects

The implication of these differences between images and more direct perceptual experience is that images are likely to be far more responsive to internal need states of the individual and far more easily influenced thereby than are perceptual responses The less thinking is influenced by direct perception, for whatever reason,² the more likely it is that images will predominate, because, up to a point at least, images subserve the changing needs of the organism more easily than do the experiences of direct perception, that is, images are more easily modified, yield more easily to pressure, etc Thus, in the bipolar relationship stated above, as thinking shifts toward the realistic pole, images tend to decrease and perceptual response tends to dominate, and as thinking shifts toward the internal-need pole, perceptual responses become less dominant and images become more numerous and stronger Either realistic thinking or imaginative thinking may, at any moment, be carried out at a verbal level by translating images, or perceptions, and manipulations into words In either case, the translating represents at least a minimum organizing and integrating process Furthermore, there are many occasions on which imaginative thinking occurs in words, with images absent or incidental Hence, it may be reiterated that it is not the content of thought which distinguishes imagination from realistic thinking, or reasoning, nearly so much as the situation in which the thinking occurs and the amount of control or kind of determinant involved Imagination, according to this view, is mental activity relatively free from external demands, not merely the manipulation of images

Needless to say, images may have as many properties as there are properties of the sense organs in which the original responses occurred

²The reasons may be lapse or weakening of attention strong inner pressure, ambiguous or vague stimulus field etc

between the two poles, perhaps relatively more realistic or relatively more imaginative, but shifting back and forth. Some of the kinds of data which reveal the intermediate ground of thinking are those obtained from the use of projective techniques, from studies of creative activities, from recent studies of selective factors in perception, and from the investigations of concept formation and problem solving discussed in a previous chapter. Murphy (38) states the relationship for perception in this way: "The outer world can never be so completely unstructured as to make perception depend solely upon the perceiver, but it can never be so sharply and clearly organized as to obliterate individual differences among perceivers" (p. 353).

IMAGES

Although imagination is here considered to be thinking which is determined more by internal conditions of the organism than by demands of external reality, it has often been defined as the manipulation of images (15, 23, 38, 42, 46).¹ This definition is perhaps designed to emphasize the same points made above, namely, the internal nature of the activity, its relative independence from current external stimuli, and its apparently freely plastic character. On the other hand, this definition has certain limitations, aside from oversimplification and tautology. It implies a sharper distinction between imagination and other aspects of thinking than can be sustained by a modern psychologist. It is an inheritance from the structural psychology of fifty years ago (see Chapter 4), implying both that images are the ingredients, so to speak, of imagination and that something else is the element of other thinking, once said to be ideas. To accord with the facts, it would be better to say that the ingredients are the same in all thinking but that the situations, the determinants, and the outcomes differ. It is true that the psychologist is forced to talk about *something* at a level of abstraction beyond neural activities and their field relationships, hence the ingredients of thinking may be given the names of perceptions, images, words, attitudes. The point is that all these ingredients compose thinking in all situations.

Be this as it may, there is no doubt that images play a very prominent role in imagination, especially in the extreme forms to be discussed in the next chapter. Various forms of imagery were briefly discussed previously (Chapter 4), but a few additional points need to be developed here with reference to imagination.

In the first place, an image or the recurrence of previous perceptual response without the original overt stimulus, has certain important char-

¹ Not all these writers present this simplified view. Woodworth, for example, defines imagination more generally as "mental manipulation."

3 Guidance of Action Imagination is also utilized as a means of anticipating the future. In such instances, the individual may, of course, deliberately evaluate alternative courses, thus engaging in activity which we have included under the name of problem solving. On the other hand, there may be no effort to solve the problem but merely a free roving over the possibilities, with inner states shaping them. At a later stage, this preliminary imagining may, of course, be utilized in more controlled fashion. The distinction between problem solving and imagination cannot be drawn very sharply under these circumstances, rather, the two may alternate or blend before some action results.

4 Constructive or Creative Thought The same considerations apply to that aspect of imagination which has been linked to artistic or inventive endeavor (see Chapter 12). Here again many different degrees of imaginative thought may occur, ranging from extreme fantasy to a more controlled, problem solving type of activity. In any case, the essential features of constructive imagination are twofold, for it involves, on the one hand, thought at various stages which is relatively free from external strictures and, on the other, the deliberate choice from the components of this thought and its definite formulation in a final product.^a

5 Anxiety It is a very common experience for imaginative thought to increase with an increase in anxiety, arising from the myriad causes now recognized by psychologists (41, Chap. VI). The tension state associated with anxiety may interfere with the individual's efficient response to current demands of the external world (to reality), with the result that inner mental processes—memories, possible solutions to problems, feared outcomes, desired possibilities, restructurings of the self—become dominant. This upwelling of imaginative activity appears to have a self-reinforcing quality (as indeed do all imaginative activities), so that it tends to become greater the longer it persists. Perhaps the reason lies in the fact that the mental processes increasingly release and elaborate the needs and fears associated with the anxiety, since they cannot be satisfied by imaginative activity.

The five functions of imagination presented above are essentially normal and common in every day life. When, however, they become exaggerated, each encroaches upon the pathological. For example, enjoyment of reliving the past may become a withdrawal from the present, an absorption in memories. What is a normal appreciation of the external world in one person may in another be a refusal to perceive or accept reality except in accordance with personal needs and wishes. Preparation for

^aNeedless to say there are many other considerations such as intelligence skill and training and personality variables which enter into creative thought (see Chap 12).

Because visual images are usually the strongest and most frequent, it is easy to overlook other kinds. Nevertheless, if attention is given to them, auditory, tactual, thermal, olfactory, kinesthetic, gustatory, and other sensory images are readily reported (19). When the actual variety of imagery is recognized, it becomes an interesting exercise to inquire into individual differences. Does different imagery predominate in different people? This question is another of the historic typology hypotheses. It was investigated by Betts (11), who convincingly showed that people cannot be classified according to their dominant imagery. Rather, those persons who have imagery at all tend to display comparable degrees of all kinds.

FUNCTIONS OF IMAGINATION

Considered in a general way, imaginative thinking is mental activity determined by inner-need states, but certain more specific functions may be identified in everyday life.

1 Enjoyment and Play It is common for the individual to reminisce—to relive (38)—pleasurable past experiences merely for their own sake, without requiring that they have immediate relevance or meaning in the present situation. On such occasions, the reliving may not be purely passive reproduction, but past experience may be reshaped or recombined without regard to what actually happened. At other times, in various forms of play or conversation it may not be so much a question of reminiscence as of freely manipulating the present situation, merely by allowing inner needs to express themselves—to determine the course of thinking.

2 Interpretation and Appreciation Related to the preceding function is that of releasing the course of thought from the strict perceptual demands of the present situation and permitting mental activities to run their course freely. Perhaps the most common instance of this function is in esthetic appreciation, where the stimulus instigates not merely particular responses objectively and literally related to the stimulus but a complex cross section of the individual's mental context, together with a pattern of pleasurable emotional responses. This function is best clarified by pointing out that a painting, although it remains the same in terms of the physical stimulus configuration, may never instigate precisely the same responses twice. But this function is not limited to esthetic experience. At any moment, a stimulus may arouse a free train of thought which represents an interpretation or appreciation of external reality. In fact, it accompanies to some degree nearly all everyday experience, becoming freer and richer the less strictly the individual requires that his activity be determined by the specific stimulating conditions.

low correlations with intelligence (5), or correlations very little higher with MA than with CA (34). Within limits, it is likely that age differences are more important than intelligence differences, as far as very young children are concerned (18).

Sex Marked differences are manifested here in the nature of play and in the kinds of toys and games engaged in. Thus projective play techniques reveal differences related to personality factors (7, 48). Boys, for example, display more aggression and less "nicety" and stereotypy than do girls, probably, to a large degree, as a function of the different upbringing of the two sexes. The activities preferred by boys in comparison with girls no doubt reflect these conditions also (18, 30, 31). In general, sex differences in play become greater with increasing CA, to about 8 to 10 years, after which they seem to decrease (31, 35). Where the quantity and the general quality of play have been assessed apart from preferences and types of behavior, very slight differences, if any, are found between the sexes (34).

Group Organization Constructiveness of play and amount of time spent in play are both greater in pairs of strong friends than in pairs of weak friends, similarly for social, in comparison with solitary, play (47).

Socioeconomic Status The kind of play also appears to vary with socioeconomic status. One investigator found that children of relatively low socioeconomic backgrounds more often engage in types of imaginative play closely connected with prosaic, everyday events, children from backgrounds of higher socioeconomic status displayed more fanciful imaginative activity (34).

Environmental Conditions Many different kinds of environmental condition influence play. General factors, such as urban and rural conditions, climate, topography, etc., have significant effects, as well as more specific factors (31). For example, jumping-rope rhymes reflect current events of the adult world (17), and the recent war apparently had a strong effect on active dramatic play and the choice of toys (14). It is common to find the family relationships of children entering into their play activities (21). Frustration also has a marked effect. Constructiveness is greater in free play than under frustrating conditions (47), and, by the same token, aggressive responses related to the source of frustration increase (7, 8, 48).

DEVELOPMENT OF IMAGINATIVE PLAY

Imaginative behavior in children is bound up with their play. Many theories have been advanced to explain the reasons for which children play (26), but there appears to be no one simple explanation. Play involves the practice of motor skills and verbalization, learning processes, such as familiarization with the environment and socialization, and ad-

action through imaginative activity may become an inability to accept the actual event when it happens. Constructive imagination may become exaggerated into the bizarre, the utterly fantastic, the impossible, the misshapen creation. Anxious imagination may become neurotic fears, agonizing conflicts, painful and debilitating worry.

RESEARCH IN IMAGINATION

Aside from the widespread interest in fantasy, dreams, and autism linked with the study of personality, the investigation of imagination has crystallized at the present time in two directions. One of these has to do with the development of imaginative activity in the child. In this connection, efforts have been made to classify the types of imaginative response occurring in children, to study their incidence at various ages, and to relate this activity to such factors as intelligence, socioeconomic status, and emotional states (notably frustration and anxiety). A large share of the interest has been devoted to play, out of which have gradually developed the modern theory and techniques of play therapy.

The second focus of attention has been the thriving field of projective techniques, representing an effort to obtain information about personality through the channels of imaginative response. It is in this area that the most striking evidence is found of the relation between mental processes and inner needs of the individual.

Both these research emphases have exploited the types of situation in which imaginative activity, in contrast to realistic thinking, occurs. In play, the child becomes freed from the demands of reality and allows his own inner states to determine his activity. In a projective technique, the material is so devised as to minimize response to the stimuli as such. In consequence, the individual is more likely to perceive them as he wishes or to construct the material in accordance with his own personality.

FACTORS RELATED TO THE IMAGINATIVE ACTIVITY OF CHILDREN

Although individual differences among children vastly outweigh group differences, it has nevertheless been found that imaginative activity varies in accordance with certain general factors. Some of the most important of these are intelligence, sex, group organization, socioeconomic status, and environmental conditions. The nature of these influences may be briefly indicated.

Intelligence In assessing this relation, it has been found that bright children, on the average, play more or longer during the day than do duller children (16). The difference is more in mental forms of recreation than in physical activity. Other studies, which have attempted to use qualitative as well as quantitative measures, have found comparatively

carrying with it the codification of rules and a very wide variety of games (18, 31). Although imaginative play involving physical activity persists into adulthood, more sedentary and often more solitary, activities become dominant, such as gardening, reading, and the development of special hobbies.

Ames and Learned (4) have presented an "imagination gradient," which traces some of the dominant lines of imaginative development (see Figure 13). Up to 2 years, play is predominantly with objects, but thereafter, they suggest, four directions of development diverge, as follows⁴ (1) possessing an imaginary animal, human companion, baby, etc., leading eventually to imaginary friends of the opposite sex, (2) imagining being a baby, animal, or another person, conceivably leading to social play and imaginative participation in group activities, (3) animating objects, leading to possession of imaginary objects and the personalizing

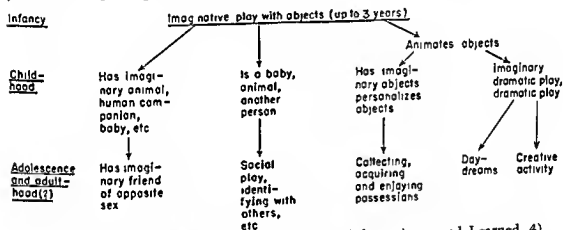


FIG 13 A possible imagination gradient (adapted from Ames and Learned 4)

of objects, possibly ultimately culminating in collection, love for possessions, "playing" by acquiring and owning possessions, and (4) animating objects in imaginary dramatic play, leading to dramatic play and finally reaching daydreams, on the one hand, or imaginative and creative writing or other creative activities, on the other.

This formulation has a great deal of value, although it is largely speculative, since insufficient genetic studies have been made to verify the development of the postulated trends. Furthermore, it is probably incomplete, since imagination may develop in still other directions. Perhaps the two major trends which need to be fitted into the scheme are motor play and athletic activities, and construction.⁵

⁴The author has carried their formulation into a few possible outcomes in adolescent and adult life.

⁵There is no need to suppose that any one person is necessarily characterized by only one trend. It would be interesting to know to what extent development of the individual combines the four directions or tends to be dominated by only one.

justment processes, such as the relief of emotional tensions and the working out of conflict or problem situations

Studies attempting to trace the development of play have approached the problem both from the standpoint of characteristic mental activity and fantasy and from that of overt behavior. In the very young child, of course, it is difficult or impossible to obtain data of the former kind. In the case of older children, fantasy and overt behavior are closely interrelated. We shall summarize the general trends observable in several representative studies without differentiating sharply between the two aspects of imaginative development. It should be remembered that successive stages merge gradually into each other, with the result that changes are continuous rather than sharply distinct from each other (31, 35)

The origins of play lie in motor behavior (18, 27, 28, 30, 46). Manipulative play is characteristic of the first two or three years, during which time a wide variety of motor skills are practiced and improved. At about the second year, language becomes important (27, 34), although not all children verbalize in play (27). As growth proceeds and play becomes more varied and elaborate, language, for those children who verbalize, also becomes more complex. Other important trends gradually emerge during the second and third years. In block building, children gradually learn to control more space (27). Their initial nonstructural, linear, and areal play leads into tridimensional and more extensive structures. Construction in general and dramatic play become more frequent and skillful (28, 34).

There is also a progressive change in the part-whole balance. At very early ages, the child responds to parts as if they were wholes, but gradually parts are better distinguished, until by about age 6 the response to parts as parts equals response to parts as wholes (3, 5). Gradually, the end becomes more important than the activity itself, so that, by the fourth year, children are definitely carrying out ideas in their play and dealing with complicated relations and themes (3, 30, 34). Imitation of adults also becomes increasingly more important up to the age of 6 and after (28). Although the period between the ages of 2 to 5 has been called "egocentric" (18), social play of various kinds certainly has its origins in that period, quite possibly the modern emphasis on nursery schools is encouraging earlier development of social play. Coincident with the usual point of entering school and the consequent broadening of experience, at age 5 or 6, the child becomes increasingly social in his play (18, 28, 31). Competitive and cooperative activities engage the child's interest, and group membership and structure begin. At the later ages of childhood and during adolescence, group play is the most typical,

clinical study and treatment of behavior disorders in children. As stated by Axline, one of its foremost exponents, "Play therapy is based upon the fact that play is the child's natural medium of self-expression. It is an opportunity which is given to the child to 'play out' his feelings and problems." (6, p. 9)

Although play therapy, like other therapies, may be directive in nature (24), the method used with great success by Axline is nondirective in nature. The situation in which the child is placed is as free from restrictions as possible. It is permissive, warm, and friendly, the therapist accepts the child exactly as he is and treats him with respect. Only those limits are established which are absolutely essential, such as those required to protect both the child and the therapist from physical injury. Of course, as treatment proceeds, there is a gradual increase in limits and regulations beyond those initially necessary to link the therapeutic situation with the real world. The child slowly works them out for himself with the neutral, objective assistance of the therapist.

The playroom itself is planned in such a manner as to provide a wide variety of materials and equipment appropriate to the play of children. In it, the child may do as he pleases, venting pent up emotions in aggressive action, throwing a temper tantrum, or sitting without stirring. Depending upon the child, the play situation has the function of permitting catharsis by working out emotional tensions or of gradually releasing the barriers to normal emotional expression. In any case, the ultimate aim is assisting the child to recognize and clarify his own emotional attitudes. With such understanding, the child can begin to work out for himself ways to deal with his problems. Thus as the child manipulates the toys, or constructs imaginary objects, or paints pictures, he comes to realize that he is expressing his own personality and is able to interpret and judge his own needs and actions. In more advanced stages of therapy, the play situation may become social, with the introduction of other children, relations with other people can be made an integral part of the treatment.

IMAGINATION AND PERSONALITY

It is natural that the study of imagination should be linked closely with that of personality, since the latter is the effort to understand the inner organization and dynamics of the individual. The more freely the inner needs are permitted to express themselves, the more information, presumably, one can obtain about personality.

Although it is a commonplace observation that personality is revealed by imaginative behavior, it is not easy to determine the nature of the relationship. It is possible to distinguish two principal modes of approach to this problem. On the one hand, understanding of a personality may

IMAGINARY COMPANIONS

The occurrence in children of imaginary companions has aroused so much interest that it deserves special mention. One general conclusion to be drawn from the considerable number of investigations made of this phenomenon is that imaginary companions are not only normal and comparatively common occurrences in children, but that they have positive value in personality development (4, 10, 29, 40, 45).

Somewhere between 15 and 30 per cent of children have imaginary companions of some kind, the latter figure seems to apply to adults who report having had such companions, the former to the incidence in fairly young children, the difference apparently resulting from the fact that the age at which the phenomenon occurs varies widely. Imaginary companions are found, according to reports, in children of less than 2 years and may persist into adulthood. They are more common in girls than in boys.

It is probable that imaginary companions serve as a mechanism to supplement environmental deficiencies, to assist in the handling of emotional difficulties, or to help in the internalization of parental attitudes. Bender and Vogel (10) find that imaginary companions in nonpsychotic problem children are a function of unsatisfactory relationships between the children and their parents or of unsatisfactory experience in the real world. However, in the average normal child, there is no need to suppose that such extreme conditions are responsible. In various cases, the factors may be lack of companionship (40), or the idealization of desirable personality traits, or a method of bringing the difficult adult world within the scope of the child's activities. Actually, a great many different conditions may be responsible, depending upon the problems and needs of the child.

Generally speaking, the imaginary companion has a distinct personality and is frequently given a special name, which may be commonplace, original, mysterious, or derived from admired real persons or from stories (29, 40). There appear to be few, if any, instances where the child dislikes the imaginary companion, rather, the relationship is typically pleasurable and is valued as an important part of the child's private life. It usually develops and is abandoned gradually, although some people report only a single incident involving an imaginary companion. In sum, the phenomenon is usually normal and constructive, serving as a mechanism to aid in adjusting to the environment.

PLAY THERAPY

As mentioned above, the study of play and the growing recognition of its significance in personality development have led to its use in the

especially valuable, in all probability, will be the study of projective techniques as such, together with their systematization. At their present stage of development, the primary emphasis is on the practical training in, and use of, the techniques, with the result that the field is chaotic. The efforts of some people, like White (44) and Bell (9), to make order of it promise to have valuable consequences.

As a crystallization of the approach to personality through imagination, projective techniques have four major functions, not always clearly recognized.

Imagination in General The first has simply to do with the way inner needs are expressed, what goes on in the individual's mind, how an individual responds in a situation relatively free from external demands. In this first respect, perhaps, projective techniques clearly contrast with intelligence tests, in which problem solving, or controlled thinking in relation to the external world, is the primary focus of concern.⁶

Diagnosis This second function is one probably too frequently emphasized at the expense of the others. Projective techniques have seemed to be a way to ascertain quickly, easily, and objectively the personality structure and functioning of the individual, and hence they have inevitably more often been utilized in the study of clinical cases than in that of normal people. The terminology most frequently found in the field of projective techniques also reflects this intense preoccupation with the clinic, to such an extent that psychiatric concepts have tended to become universal in the description of even the average, normal person. More work with the latter and the formulation of continuous variables operative in imaginative productions would be valuable tasks for the future.

Catharsis Projective techniques may also have the function of the relief of emotional tension. Perhaps this function should be extended to include self-expression in general. Even without any other concern, the imaginative situation of projective techniques permits the individual to create, to externalize, himself, to enjoy structuring an otherwise shapeless material. This aspect of projective techniques has been recognized by many experts (e.g., 2, 43).

Therapy The fourth function is related to the third. It is, however, more than simply emotional release or self-expression, since it has to do with the individual's understanding and acceptance of himself. No one, of course, would claim that projective techniques in themselves con-

⁶ Here and below, we do not intend to exaggerate the difference between projective and other methods. The former make valuable contributions to the measurement of intelligence just as the good clinician attempts to interpret intelligence test performance in qualitative terms and to find out *how* abilities are utilized.

be sought in the *content* of imaginative productions, on the other hand the search may be directed toward the underlying characteristics of the response itself—to the *structure* of the response. Some tests such as word association tests and the Rorschach appear to lend themselves primarily to the latter approach, others, such as doll play and the Thematic Apperception Test, lend themselves more to the former approach. No hard and fast division can be drawn, because the alert clinician would seek for meaningful information in both directions. For example, in the free association test, where the subject is asked to give the first word that occurs to him upon presentation of a stimulus word, the particular responses are usually much less significant than various aspects of how the response is given. Such indicators include the reaction time, blocking, signs of emotional associations, etc. On the other hand, there may be occasions when the response words, perhaps in combination with complex indicators, are clues to an underlying problem or pattern of ideas. The chief disadvantage of relying upon the content of responses is an obvious one, namely, that the individual may, consciously or unconsciously, distort or conceal the true effect of the stimulus upon him. Seeking in the structure of the response clues to personality organization goes far toward avoiding this limitation even though still other difficulties arise in this approach. For instance, there is the problem of validating the relationship between the character of the response and the underlying personality variables. In general, it is likely that deep lying dynamic factors in personality, which determine not just one but many responses, would manifest themselves more meaningfully in the structure than in the content. At least, this hypothesis would hold for the diagnostic use of projective tests. The content of any test may provide important material for discussion with the subject himself.

As pointed out in many current sources, any type of imaginative production, whether dreams and fantasy, play, free association or word association, or responses to projective techniques, may be useful in penetrating into personality (9, 38, 44). The only requirements, really, are a situation in which external determinants are at a minimum and some scheme, theoretical or quantitative, for interpreting the data.

Research is extremely active in seeking to understand and satisfy more fully both these requirements. A constantly growing variety of projective situations is being developed, most of them hardly more than suggestions as yet. Theories of personality and its relation to imaginative productions are under continual discussion. Quantitative methods for linking imaginative response to personality and, equally importantly, the evaluation of those methods are in a particularly flourishing state. All these directions of work need to be pursued with continued energy,

TABLE 5. SOME PERSONALITY DIFFERENCES BETWEEN NURSERY-SCHOOL CHILDREN AS A GROUP AND THOSE WHO USE COLOR IN VARIOUS WAYS*

Color characteristics	Personality characteristics	Group in column 1, %	Total group, (N = 170), %	CR†	P‡
Preference for red (N = 46)	Dependent on adults for affection	39	24	1 88	3
	Good adult relations	74	56	2 37	1
	Good child relations	72	49	2 99	<1
	Talk a great deal	65	43	2 72	<1
	Good adjustment	82	64	2 65	<1
		75	52	2 95	<1
Preference for blue (N = 40)	Play alone	60	43	1 95	3
	Orderly, careful work habits				
Overlaying cold on warm colors (N = 49)	Repressed	37	24	1 57	7
	Play alone	69	52	2 07	2
	Initiate contacts	67	51	1 91	3
	Actively seek materials	71	56	1 85	4
		36	24	2 00	2
Overlaying in general (N = 85)	Repressed	62	49	2 03	2
	Good relations with children	53	38	2 38	1
	Protect selves	55	43	1 88	4
	Orderly, careful work habits				
Kept colors separate (N = 33)	Cooperative in routines	76	55	2 50	1
	Ideas for play	70	48	2 47	1
	Show good adjustment	88	64	3 53	<1
	Good relations with adults	73	56	1 98	3
	Lead through ideas	48	31	1 79	4
	Realistic orientation	48	28	2 13	2
	Purposive, planned work habits	64	41	2 47	1
	Orderly, careful work habits	64	43	2 26	1

* Adapted from Alschuler and Hattwick (2)

† CR is an abbreviation for critical ratio

‡ P is the probability, here expressing the chances in 100 that the obtained difference between the two percentages is not a true difference

studies, and records of performance with the other media. In general, it was found that color is strongly linked with the child's emotional life, line and form with energy and its control, and space usage with the child's reactions to his environment. As an indication of the results, Table 5 has been prepared. It contains a sampling of the statistical data relating to the choice and use of color.⁸

⁸ See Alschuler and Hattwick (2), Vol II, Tables IA, IIA, IXA, XB, XIB

stitute methods of treatment, rather, the important thing to observe is that they may be an integral part of the therapeutic process, ranging from catharsis and the relationship between the clinician and the patient to the supplying of material which may be used by the patient in gaining insight into his problems. As a further extension of this idea, projective techniques may enter into therapy by providing a record of successive stages in the course of treatment. Such data may be as valuable to the patient as to the physician.

EXPERIMENTAL STUDIES

Two excellent studies exemplify the way in which imaginative behavior can be used to explore personality. In the first investigation, by Alschuler and Hattwick (2), a prolonged, longitudinal study was made of the relation between painting (and other imaginative productions) and the personalities of nursery school children. In the second investigation by Blum (12), psychoanalytic concepts were tested by means of cartoons.¹

Alschuler and Hattwick Investigation The children studied by Alschuler and Hattwick were 2½ to 5½ years old. Observations on 149 of them were made almost daily for a year, and 21 were observed for an additional year. In addition to the creative products and detailed observations made in the nursery school environment, large masses of data were obtained on home background and behavior. Thus the investigation has the great merits of providing a continuous record, over a long period of time, and a great variety of data which can contribute to cross-checking of results. A third advantage is that the children were observed under essentially natural, rather than standardized, conditions, where their behavior was spontaneous. The data thus assembled were analyzed both in terms of general trends for the group as a whole and in terms of individual case histories.

During the course of the study, five media were available to the children, easel paints, crayons, clay, blocks, and dramatic play. All these are natural in the nursery school environment, can be made readily accessible to the children with a minimum of supervision, and lend themselves very well to self-expression.

Most of the analyses were based upon performance with easel paints and crayons, partly because the products could be preserved. The conclusions reached by the investigators represent a careful integration of material from the quantitative analyses of the paintings, individual case

¹ In citing these two studies the author does not intend to imply that they prove the validity or reliability of painting and the Blacky test as projective techniques. His aim is to use them to illustrate research possibilities in the exploration of relationships between imaginative behavior and personality.

much more than a collection of test results, for it constitutes an intensive and extensive exploration of the child imagination

The Blacky Test The study by Blum (12) is another which contains important potentialities for future research. A series of ingenious cartoons was prepared, showing various situations involving a family of dogs, Papa, Mama, Tippy, and Blacky. Each situation was designed to tap some facet of psychoanalytic theory. For instance, Cartoon I, "Oral Eroticism," shows Blacky nursing, Cartoon IV, "Oedipal Intensity," portrays Blacky lurking behind some shrubbery watching an affectionate exchange between Papa and Mama, Cartoon X, intended as "Positive Ego Ideal" for males and "Love Object" for females, shows Blacky day-dreaming about a large, handsome male dog, Cartoon XI is the opposite situation. Other cartoons represent oral sadism, anal sadism, masturbation guilt, castration anxiety (males), penis envy (females), positive identification, sibling rivalry, and guilt feelings. When presented to females, Blacky was called the "daughter", to males he was represented as the "son". The subjects were shown each cartoon in succession, as items in a test of imagination, and were requested to write a brief story about it. Following the story, several specific questions were asked. After completion of the whole series, the subjects indicated whether they liked or disliked each cartoon. A method of scoring was worked out to determine for each subject the strength or weakness of the dynamic factor suggested in the cartoon. Analyses were then made of sex differences and patterns of relationship between dynamic trends both of which were compared with expectations from psychoanalytic theory. The subjects were all adults (college students), 119 males and 90 females.

As an illustration of the findings, let us consider just one of the cartoons, Cartoon VII, "Positive Identification." It shows Blacky sternly shaking his finger at a little toy model of a dog.

With respect to sex differences, it is well known that psychoanalytic theory outlines a process whereby the boy comes to identify himself with his father and the girl with her mother. Questions with reference to Cartoon VII asked the subjects in various ways who Blacky is imitating in his (her) manner toward the little toy dog. On four such questions the men significantly tended to respond "Papa," whereas the women responded "Mama." Cartoon VII similarly confirmed the psychoanalytic view that identification is more ambivalent in women than in men and that more women express hostile impulses toward the identified parent. More specifically, a greater proportion of males said that Blacky would rather pattern himself after Papa than females said that Blacky would rather pattern herself after Mama. When presented with four alternatives to the question "What would Blacky have an impulse to do

It will be observed that some striking differences appear in the personalities of those who prefer different colors and who use colors in different ways. Putting together the kind of data shown in Table 5 and the study of individual cases, it appears that children who preferred red were relatively free in their reactions and comparatively well adjusted. Red was also used sometimes to express hostile emotion by means of heavy strokes, long, wide strokes, etc. Children who preferred blue were typically controlled, rather than free, in their expression. In some instances, this control appeared to be self-restraint, or repression ("blue of controlled anxiety"), in others, it appeared as outwardly directed, adaptive behavior ("sublimation blue"). Preference for other colors was similarly associated with particular personality characteristics. Consistent choice of yellow was made by dependent, emotional children, whereas green was preferred by restrained children who showed generally good social relationships.

Of equal interest is the manner in which the colors were used. For instance, some children tended to overlay one color with another. The authors believe that this phenomenon indicates that the child is hiding under an assumed pattern of overt behavior. The color most frequently used for overlaying was blue, which, as noted above, appears to be associated with tendencies toward control. The children who used cold colors to overlay warm colors were more often repressed, more often played alone, initiated contacts, and displayed such signs of control as orderly work habits and an inclination to name their paintings. In contrast, children who placed colors separately on the page seemed to be directing their energies outward, to be adapting to environmental expectancies or making an effort at control. Thus they were cooperative, self controlled, and well adjusted, had good relations with adults and a realistic orientation, and displayed purposive, planned work habits. Two other kinds of color usage were noticed, intermingling and indiscriminate mixing, the former characterized children who were well adjusted, realistic, and more emotionally free than the children who overlaid colors or placed colors separately, the latter occurred primarily in very young, immature children.

We have summarized merely a very few of the findings in this important study. Aside from omitting other features of painting than color, we have not here gone into representational aspects, such as self-portraits and the expression of specific emotional problems or into developmental trends as revealed in the data. The investigators have demonstrated very convincingly the intimate relationship between personality development and imaginative productions. Their methods and the hypotheses arising from their results have great promise for future research. The study is

poses Projective techniques, on the other hand, have become linked primarily with individual case study, with special emphasis on the diagnostic function mentioned above

Rapaport (39) has formulated the basic principle behind projective techniques, as follows "All behavior manifestations of the human being, including the least and the most significant, are revealing and expressive of his personality, by which we mean that individual principle of which he is the carrier" The aim is to get meaningfully at the private world of the individual, "that peculiar, individual way of organizing experience and of feeling which personality implies" (25) "A projective method for the study of personality involves the presentation of a stimulus situation designed or chosen because it will mean to the subject, not what the experimenter has arbitrarily decided it should mean, but rather whatever it must mean to the personality who gives, or imposes upon it, his private, idiosyncratic meaning and organization" (25) The idea therefore is to present to the subject a situation in which the subject puts himself into the situation or externalizes himself (9) It is to meet this requirement that so much effort has been expended to find unstructured materials to present to the subject which, at the same time, can be systematized, easily scored, and meaningfully interpreted Since it is difficult to attain all these criteria, very few projective tests have actually attained widespread acceptance Consider, for example, that a generation has elapsed since work was first begun by Rorschach with ink blots, or ponder the enormous problems which still confront the person who uses the Thematic Apperception Test (43) Still other techniques which have achieved some measure of standardization require such elaborate and time-consuming administration or scoring, or both, that they scarcely warrant the trouble involved in using them

The great number of projective situations so far proposed actually fall into a small number of categories One way of classifying them is in terms of what the subject does For example, according to Frank (25), the following kinds of response may be involved (1) constitutive, representing the structuring of meaningless or amorphous material, as in the Rorschach, (2) interpretive, where the subject explains the meaning of material or suggests what is going on, as in the Thematic Apperception Test, (3) cathartic, in which the subject expresses more or less inarticulately his emotions or impulses, as in doll play, and (4) constructive, in which the subject achieves some creative product, as in completing a story, or making a village in the World Test In practice, most tests are not limited to only one of these kinds of response The Thematic Apperception Test, for instance, is both constitutive and interpretive. It is probable that any test may be cathartic

if he (she) were in the position of the toy dog? significantly more females chose "Start fighting"

Two of the interrelationships studied involve positive identification. Psychoanalytic theory suggests that males who prefer narcissistic love objects have unresolved Oedipal conflicts and identify themselves with the mother rather than the father. In Blum's experiment, responses to Cartoon VII, which, as indicated above, showed that males tend to identify with the father, had a significant negative correlation with expression of a narcissistic love object (Cartoon XI)—tetrachoric $r = -.46$, $P < .02$. A significant positive correlation was obtained between positive identification in females and sibling rivalry—tetrachoric $r = .36$, $P < .05$, although psychoanalytic theory apparently does not deal directly with this relationship.

In general, the Blacky test results give striking confirmation of many aspects of psychoanalytic theory. They certainly point up forcefully the value of the method in obtaining data in this area. One of the great needs has long been more extensive experimental verification of psychoanalytic concepts. Blum's approach and others like it are capable of yielding much more of value. Perhaps the greatest merits of this approach, from the standpoint of the psychologist, are the standardized procedure, the fact that apparently meaningful and objective interpretations can be made of the results, and the possibility of obtaining data from large numbers of subjects. Incidentally, it should be noted that some points of psychoanalytic theory were *not* confirmed, e.g., that women as well as men tend to have fatherly superegos. If, however, the possible cultural difference between American and European society is taken into account, perhaps even this result is not really counter to the theory. In any case, many aspects of psychoanalytic theory were not investigated. It is also worth mentioning that Blum's results indicate a very definite weakness in psychoanalytic theory in the realm of sex differences—a weakness not adequately remedied by psychoanalysts since Freud.

Here then are two examples of the potentialities in the use of imaginative situations for purposes other than the clinicodiagnostic interests which have become dominant. Alschuler and Hattwick point out directions in the area of developmental studies, and Blum suggests how important problems can experimentally be studied in adults. Both applications are well worth further development.

PROJECTIVE TECHNIQUES

Although the methods used by investigators previously cited may properly be called 'projective,' we have given them separate treatment because they were used much less for clinical than for experimental pur-

jective techniques may have practical applications in the manufacture and use of games, in leisure time activities, etc

One of the greatest problems still confronting those who wish to use projective methods, however, is the question of their validity. Despite a considerable body of data, much remains to be done to confirm the claims made for the value of results in relation to personality variables. It is probable that additional research on the characteristics and dynamics of imagination itself would contribute generally to a better understanding and assessment of projective methods.

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Bell (9) has classified the most highly developed tests in terms of the kind of material employed. Thus he recognizes verbal techniques, visual methods, expressive movement, and play situations.

It is totally beyond the scope of this book to attempt to review and analyze the methods proposed. It will be pertinent, however, to suggest very briefly some of the ways in which projective techniques can contribute to the study of imaginative thinking.

One fruitful line of research would be to determine interrelationships among various imaginative situations, not only to ascertain agreement between them (37) but to seek a more comprehensive cross section of imaginative thinking. Nor should such efforts be confined merely to projective techniques; it would be valuable to relate performance in imaginative situations to that in problem solving, in various learning situations, and in everyday life.

Another important direction is the study of interpersonal and intergroup relations. A good example of this kind of research is afforded by Brown's extension of the Rosenzweig Picture-frustration Test to the dynamics of prejudice (20). There are innumerable other problems in which projective techniques may be of value—in the study of leadership, industrial relations, political behavior, etc. A related area is the study of the relation between culture and personality, as begun in studies like those of DuBois and Oberholzer in Alor (22) and of Linderfelt in Hawaii (32).

Still another kind of contribution lies in the application of projective techniques to the currently active investigation of perception (36). Even without the necessity for intensive personality analysis, projective techniques can supply valuable data on regulative and directive mechanisms in the individual's relation to the environment.

The behavior of the normal person in constructive and manipulative situations deserves much more attention. Types of material, in this connection, which seem to the author to have great promise over and beyond their diagnostic value are the miniature world of the World Test (13, 33) and the Three-dimensional Apperception Test (1).

Finally, the possibilities of adapting projective situations to the uses of children and adults for everyday expressive, recreational, and cathartic purposes need to be considered. To be sure, games of all kinds abound and ever-increasing numbers of people spend some of their leisure hours in expressive activities like ceramics, weaving, painting, etc. Nevertheless, the psychologist may conceivably have a contribution to make in this area. What he is learning about the dynamics of personality, about defense mechanisms and conflict, about understanding the self, about spontaneity—all these and many other factors linked with the use of pro-

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tivities that it cannot be linked primarily with either pole of mental functioning. This point will be elaborated in the next chapter.

In the second place, it is necessary to justify the arbitrary distinction made in this book between imagination and personalized thinking. The intention is to bring together at the end, in as clear and systematic a manner as possible, those aspects of mental functioning which pertain to regulative systems. In this area, conclusions must be based upon inference, since regulating factors can only be ascertained by relating the individual's behavior to preceding conditions, the regulating systems themselves cannot, of course, be directly observed. The term "personalized" therefore pertains to the fact that each person's behavior—in this case, thinking—depends upon those unique sets of conditions in his own past experience which have resulted in the establishment of more or less permanent controlling systems. To be sure, we have assumed all along that this regulation exists and have occasionally referred specifically to it. Since, however, both realistic thinking and imagination are subject to the development, organization, and influence of the regulating systems, although different ones may, in part, be involved, we shall postpone until later a detailed consideration of personalized aspects of thinking.

Finally, a word about perception, for autism is also pertinent thereto, as we have pointed out before. There is no need to differentiate sharply between perception and thinking, they really are not two different categories of mental activity but intermingling stages, distinguished for convenience in terms of the immediacy of response to the stimulus. Our emphasis is merely on what happens at a later and, usually, deeper stage than that immediately following the occurrence of the stimulus. Hence much of what we say, especially in the last part of the book, can equally well be related to perception.

FUNCTIONS OF AUTISTIC THINKING

Some functions of imaginative thinking were cited in the preceding chapter. They expressed rather general factors which accompany and elaborate the processes of adjusting to external reality. The more extreme aspects of imagination, included under the heading of "autistic thinking," have the same kinds of function, but to a relatively greater degree. Autistic thinking is not so much an accompaniment to realistic thinking as imaginative thinking may be, since it is a state of detachment from reality, or a lack of responsiveness to it, or an alternative response, etc. Thus the following mental activities may be linked specifically with autistic thinking.

1 Wish Fulfillment Autistic thinking frequently takes the form of vicarious satisfaction of desires, *i.e.*, a wish, or need, or impulse is ful-

Chapter 11. AUTISTIC THINKING

In the last chapter, we were concerned with some general aspects of imaginative thinking. An attempt was made to indicate the relationship between inner needs and overt behavior, a relationship which is most clearly apparent in play, in expressive activity (such as easel painting), and in response to projective tests. In this chapter, we shall sketch the outlines of other products of imaginative activity.

Why, then, do we entitle the present discussion "autistic thinking," thus differentiating it from other aspects of imagination? One reason is that the term 'autistic' has been used increasingly by psychologists to refer to states of fantasy, hence, it has a prior sanction in this connection. The major reason, however, for employing some distinguishing name for the phenomena to be considered now is that we seek to imply a more extreme detachment from reality than was intended in the last chapter. Fantasy, dreams, and wishful thinking are all best understood by conceiving of them as responses to internal stimuli, to the virtual exclusion of objective facts and demands. This is not to say that external stimuli may not partly determine the response, it is a matter of degree only, in accordance with the bipolar process previously defined.

It may be useful at this point to draw these distinctions together in the form of a little summary, as follows:

'Imagination' is a general term used here to include all phenomena influenced relatively more by inner needs than by external demands. Under it we have subsumed three major classes of phenomena. *Images* have been included, in a general sense as responses in which previous perceptions recur. *Imaginative thinking* refers to mental processes in which the free activities of imagination are evoked primarily by external stimuli, typical situations of this kind are *play* and *projective tests*. *Autistic thinking* refers to mental processes in which the free activities of imagination are evoked or influenced primarily by internal stimuli, namely *fantasy*, *dreams*, and *wishful thinking*.

A few additional considerations must be mentioned. In the first place it will be noted that *creative thinking* has not been placed in the above scheme. The reason lies, as we have mentioned before, in the fact that creative thought appears to be so bound up with problem solving as

It is even desirable to go one step farther by recognizing that there is more than one degree of fantasy. For instance, it might prove useful to differentiate between "reverie" and "daydreaming," although it is essential to note, once more, that there is no sharp division. Nevertheless, fantasy is much freer and less subject to voluntary control at some times than at others. States of reverie might be regarded as analogous to free association, and daydreaming to storytelling or response to projective tests (without, of course, the same degree of conscious control). That is, a daydream is more likely to have a beginning, a definite structure, and a dominant theme than is reverie.

Fantasy, of either the daydream or reverie variety, tends to have certain characteristics which distinguish it from realistic thinking. Both Murray (19) and Symonds (24) have presented lists of the most outstanding of these features. The following summary of twelve characteristics combines and rearranges their two lists but appears to cover the views of both writers.

1 *Egocentric* In the typical fantasy, the subject is the hero, or at least his own problems, interests, etc., are the focus of concern. It might not be obvious from the content of the fantasy, however, that this is the case. For example, a daydream might consist of a perseverative reliving of a movie seen the night before, in this instance, it would not be difficult to find egocentric factors in the emotional reactions to the movie or in identification with the screen hero. Nevertheless, it is not so simple a situation as one in which the subject is literally the hero. There are also times when the subject assumes the role of an onlooker. Here again the personal involvement of the subject may not be as obvious as in fantasies of more direct participation.¹

2 *Anthropocentric* Fantasies usually deal with personal relationships among people. Murray (19) points out also that, when animals are involved, they are likely to be anthropomorphized.

3 *Dramatic and Pictorial* Fantasy is usually composed of actions and events, typically in pictorial form.²

4 *Pleasurable* Despite the occurrence of shocking, or horrifying, or unpleasant daydreams, e.g., those associated with anxiety or worry (cf

¹ In point of fact, it would be erroneous to assume that, even in the latter case, the meaning is obvious. We shall pursue this question further in the section on dreams below, no doubt the mechanisms of distortion, etc., also operate in fantasy.

² In view of the fact that imagery varies greatly in quantity and quality, it would be interesting to check this point further. It is usually assumed that the imagery of fantasy and dreams is predominantly visual. To what extent does other imagery occur? Is fantasy less frequent in persons with poor visual imagery? Or does it take different forms in such individuals? The author cannot hazard a hypothesis since his own fantasies are characterized by strong visual imagery.

filled by means of imaginary action. This function ranges from direct, simple fulfillment to much disguised and indirect satisfaction. By the same token, autistic thinking varies widely in the awareness by the individual of the wish, in the imaginativeness of the ensuing mental activity, and also in the degree of deliberate control of it.

2 *Escape* Difficult, or frustrating, or conflict situations can often be avoided, at least temporarily, by withdrawal from them and substitution of more pleasurable imaginary situations.

3 *Relaxation* Even without specifically frustrating conditions, the individual may withdraw into autistic thought simply as a pleasant change, for enjoyment.

4 *Explanation of Reality* There are occasions when almost the only response possible is an autistic one. For example, in all sorts of ambiguous situations, where it is difficult or impossible to ascertain the external stimulus configuration and/or requirements for adjustment, an autistic response is likely to occur.

5 *Basis for Realistic Thinking* For the sake of completeness, it should be pointed out that constructive activity may ultimately grow out of autistic thinking, as in artistic creation, where fantasies or dreams may be converted into concrete forms, or when a structure of wish fulfillment may lead to a conscious recognition of a need and the overt means whereby it might be satisfied.

The statement of these activities suggests the kinds of condition which promote the occurrence of autistic thinking. Thus the stronger the wish together with the presence of obstacles to its realistic satisfaction, the more likely it is that autistic thinking will result. Any frustrating situation carries with it the possibility of easy escape via autistic channels. Any condition which requires that the individual suppress, or ignore, or control his own needs is a state which disposes the individual toward autistic thinking. Hence concentrated effort, boring or disagreeable work, or waiting, and prolonged exposure to intensely stimulating conditions are likely to facilitate the occurrence of autistic thinking. In general, the more confusing, ambiguous, unreal, or unpleasant a situation, the more probable it is that autistic response will result.

FANTASY

The term "fantasy" has been used to distinguish the wish fulfilling mental activity of waking life from that which occurs during sleep, *i.e.*, dreams. Many psychologists even include responses to projective tests, without attempting to distinguish, as we have done, between imaginative activity which involves contact with reality, and fantasy, in which there is much greater detachment from reality.

In addition to these qualitative aspects of fantasy, a number of possible quantitative variables have been suggested by Murray (20). These factors include "inducibility," strength of action involved or relation to action ("actional potency"), level of aspiration exhibited in the fantasy, amount of terminal satisfaction, degree of concentrated absorption, number of external incentives rejected or positive needs inhibited, endurance, frequency, accompanying emotion, and accompanying pleasure or unpleasure. These 10 variables have been very inadequately studied, especially at the group level of analysis. We can merely cite them, at the present time, without being able to present relevant experimental data. This information might be obtained, in accordance with our discussion in the last chapter, by employing projective techniques for the general purpose of studying imagination,² even more needed are data on spontaneous fantasies.

✓ THE STUDY OF FANTASY

As might be expected because of the subjective character of spontaneous fantasy, systematic data concerning it are very scarce. Although materials about the fantasy life of individual persons are scattered extensively through the literature in clinical psychology, only a few investigators have attempted to study fantasy behavior as a normal phenomenon. Except for these studies, therefore, our systematic knowledge of fantasy is closely linked with imaginative responses to projective tests. The latter have apparently diverted interest from spontaneous fantasy to the more controlled and quantifiable test situation.

Rather elaborate attempts to study spontaneous fantasy have been made by Griffiths (10) and Jersild, Markey, and Jersild (14). Griffiths devised a technique which combined features of several procedures, notably, observation, interview, free association, and projective testing. Children were brought into a room, where the experimenter awaited them. They were permitted to talk and act as they pleased, with the experimenter recording everything that was said. At a suitable break in the flow of conversation, one of the test situations was introduced. These consisted of free drawing (together with an inquiry regarding the product), presentation of a series of irregular and asymmetrical ink blots, a request for an original story, a request for a report of the previous night's dreams, and an imagery test in which the child covered his eyes and talked about what he saw. The tests were not given in a set order, although an effort was made to obtain reactions to each one in every session. Throughout, the experimenter in a nondirective manner continued to question the child.

²See Chap. 10, p. 214.

Jersild, Markey, and Jersild, 14), the largest proportion appear to have positive emotional satisfaction for the subject. No doubt this characteristic depends upon the stimulus arousing the fantasy, the circumstances under which it occurs, etc.

5 *Exaggerative* In line with all the other characteristics of fantasy is the fact that there is no restriction on quantitative features. Relations with people may be extremely aggressive and emotionally idealized, possessions may be acquired and used in unlimited degrees, etc.

6 *Time Manipulative* In fantasy, the usual restrictions of overt activity pertaining to time no longer hold true. Past and future may be blended; for example, events may easily and quickly skip from one period to another, or particular moments may seemingly be prolonged. As Symonds expresses it: 'Fantasy [may be] stimulated by present desire and its frustration. [It may go] back to the past when a similar wish was fulfilled, and it is only through past experience that imagination can conjure up fulfillment. Then fantasy imagines how this wish might be fulfilled in the future' (24, p. 492).

7 *Private, Secret* It is of course evident that fantasy is subjective and not by its nature a process of communication with others. Beyond this, however, is the fact that it very often deals with matters which the individual positively would not or could not convey to others: either because the fantasy is or should be repressed, or because it would not meet the sanction of others. If a fantasy is expressed, it runs the risk of destruction when exposed to realistic considerations.

8 *Lacking in Exigency* Because it is free from external demands, fantasy is not governed by a sense of urgency or by the pressure of realistic demands.

9 *Monopolizing of Attention* Once aroused, fantasy tends to dominate the individual's thoughts, to detach them from the external world.

10 *Hardly Conscious* Although vivid enough, perhaps, while they are occurring, fantasies are usually 'dim and shadowy' (24) once contact is reestablished with reality. Furthermore, the individual typically is not clearly aware that he is fantasizing while so occupied, because the fantasy occupies the individual's attention. Thus fantasy is not unconscious in the sense that it is outside the field of attention (cf. Chapter 3) but rather in that it represents a reduction or even absence, of contact with external stimuli.

11 *Autonomous* Fantasies "come and go without any accompanying conscious effort" (19).

12 *Quasi-real* Understandable in the light of previously mentioned characteristics is the fact that fantasy, as a substitute for reality, seems to be real. This condition no doubt varies greatly in vividness.

gory, in contrast, at age 5-6, prestige and adventure occurred in 3 per cent of the daydreams, whereas it appeared in 11 per cent at age 11-12

Emphasis in the wishes lay in a desire for specific objects or conditions, whereas daydreams more often dealt with activities and amusements. This comparison, together with others, is shown in Table 6. Although the

TABLE 6 PERCENTAGES OF CHILDREN'S FIRST WISHES AND DAYDREAMS FALLING UNDER CERTAIN CATEGORIES*

Content, or nature of subject matter, in children's reports	Percentage of children's first wishes falling under each heading	Percentage of children's daydreams falling under each heading
Specific objects, toys, clothes, money, improved living quarters, etc	46.3	12.8
Activities, amusements, sports (including going to movies, reading, etc., under wishes, including daydreams about movies and stories seen or read under daydreams)	7.3	41.7
Personal advancement, prestige, heroic role, being bright, big, strong, etc., having a profession	10.6	19.0
Having a baby, being a parent, friendly contacts, visits, retaining parents (including worries about life and safety of relatives under daydreams)	11.4	4.0
Benefits for relatives, altruistic thoughts, philanthropy in involving parents, relatives, and others	17.3	1.8
Relief from irritations (including worries about falling, being hurt, being attacked by ghosts, criminals, etc., and about deprivations and irritations under daydreams)	1.3	8.4
Other categories not included above	5.8	12.3

* Table XV, in Jersild, Markey, and Jersild (14)

difference between what is consciously wished for and the content of reported daydreams is interesting enough, it is also important to notice the remarkable variety of topics included in both. Only 8 per cent of the subjects failed to report, said they did not have any daydreams, or gave unintelligible responses. In general, the themes appear to be what might be expected in response to a projective test of the Thematic Apperception Test variety. It would, however, be a valuable research project to carry out a comparative analysis of spontaneous fantasy vs. projective-test response. Better methods might profitably be sought for obtaining the former than have yet been employed for this specific purpose.⁴

⁴Possibilities that might be tried include free association, carrying further the approach by Griffiths, culling through case histories which include reports of fantasies as well as projective test results, and hypnosis.

There were many aspects of the experiment which promoted spontaneity and naturalness of rapport between the child and the experimenter. The latter adapted herself as much as possible to circumstances and sought to draw out the subject gradually, over a long period of time. In this respect, the technique borrowed from psychoanalysis. The result was that each case underwent recognizable stages of development. At first, there was a gradual lifting of inhibitions, with a consequent increase in the child's ability to reveal his fantasy and creative life. Then the child's skill in using the "tools of expression" began to improve, and the content of fantasy became clearer. Finally, the subjective content itself expanded and developed.

The data reported by Griffiths are based on 50 5-year-old children, 25 of each sex, observed in London and Brisbane. They were selected to cover a wide range in IQ. Approximately twenty sessions were held with each subject, if possible on successive school days.

An analysis of the materials obtained led Griffiths to conclude that fantasy has an important function in the emotional and intellectual development of children. It is "the normal means for the solution of problems of development in early childhood" (10, p. 187). The child manipulates his knowledge of the world in an effort to interpret and understand the situations with which he is confronted. Gradually, successively imagined possibilities lead to a resolution of the problem. The process of adjustment is seemingly bound up with fantasy rather than with more objective problem-solving activities, because the child has not yet sufficient information or organized intellectual skills to deal with problems in a less subjective fashion.

The study by Jersild, Markey, and Jersild (14) is well known to psychologists. The data were obtained from a detailed interview, which covered wishes, ambitions, best and worst happenings, likes and dislikes, daydreams, dreams, fears, and reactions to school, sex ("Would you rather be a boy or a girl?"), etc. The subjects were 400 children, 25 of each sex at each age, from 5 to 12 years. In each group of 25, 15 came from homes of relatively low socioeconomic status (attending public schools in New York City) and 10 came from relatively well to do homes (attending private schools). They constituted a fairly representative sampling of IQs, between 80 and 170.

The daydreams included a wide range of topics (30 different categories are listed). The younger children tended to report simpler and more direct daydreams, in contrast to the more complex and comprehensive ones of the older subjects. In this respect, daydreams resembled wishes. For example, 28 per cent of the daydreams reported at age 5-6 dealt with amusements, but only 13 per cent of those at age 11-12 fell into this cate-

to another person (especially an adult semistranger in a rather formalized situation) We do not intend to belittle the possible value of the stories in personality study but merely to suggest that much remains to be learned about their significance in the true life thought processes of people⁵ Sarason (22) has submitted data which purport to show the similarity between dreams and Thematic Apperception Test stories The two kinds of report undoubtedly supplement each other, but it is difficult to accept without further evidence, and a more convincing analysis, the alleged similarity

There is one final question regarding fantasy which needs to be raised What is the role of fantasy in adult life? It may be supposed that it is of fairly common occurrence and that its characteristics and functions are essentially the same as those advanced for the fantasy of children Once again evidence is available in the case histories of individual persons, but systematic, direct, and quantitative data about everyday, spontaneous fantasy are lacking

✓ DREAMS

As in the case of fantasy, so with respect to dreams, there is more theory than systematic experimental work It is true that Freud's brilliant treatise, *The Interpretation of Dreams* (9), constitutes an impressive body of careful analysis of individual dreams, but there has always existed the possibility that the theory upon which it is based has not been adequately verified At the present time, however, it must be accepted as the most comprehensive and meaningful theory available The fact that it grew out of practical clinical experience cannot be overlooked As a still further point in its favor, it should be pointed out that nonpsychoanalytic studies, such as they are, tend positively to confirm it (cf Sears, 23) As a matter of fact, the few other theories which have been advanced do not fundamentally disagree with the major tenets of the Freudian view

Putting it very simply, Freud's theory rests upon three points (cf 1, 8, 9, 13, 15), namely, (1) that dreams represent the fulfillment of wishes, (2) that, in most dreams, especially those of adults, the wish is expressed

*It might not be too farfetched an analogy to liken the story to the manifest content of dreams and the spontaneous fantasy to the latent content, unfortunately, it is quite possible that the latter itself is a stage removed from the true latent content To carry the matter one step farther, it would be interesting to know whether spontaneous fantasy may not be less disguised than dreams Perhaps the fact that fantasy occurs in a waking state in which the contrast between autistic and realistic thinking is more readily established permits freer thought processes That is the potential revision to reality acts as a set (a controlling mechanism), as if in the unconscious there were a sign reading "Go ahead imagine anything you wish it's only fantasy" In any case there is a really important question here

A study which illustrates very well the question of how closely the imaginative responses to projective tests resemble spontaneous fantasy is that of Symonds (25). In this case, 42 pictures were especially designed and drawn for use with adolescents. Stories were elicited from 40 subjects, 20 of each sex. Other data used in interpreting the results included associations to the completed stories, scores on other tests, and extensive case-history material. A careful search was made for every element in the stories which could be regarded as a "theme." In turn, general categories were devised by means of which to classify themes, and the incidences were then determined.

It was found that themes could conveniently be classified as (1) psychological, (2) environmental, or (3) stylistic. Two subcategories are listed under the stylistic heading, and a considerable number under each of the others. *Aggression* and *family relationships*, classified as psychological and environmental, respectively, occurred by far the most frequently and were expressed by all 40 subjects. Other themes which occurred in the stories of half or more of the subjects were as follows: psychological themes involving eroticism, negative emotion or depression, anxiety, altruism, success or ambition, repentance or reform, and positive emotion and environmental themes dealing with economic matters, punishment, separation or rejection, accidents, illness, or injury, school, and social relationships or gangs. It is to be noted, in addition, that the range of themes is extremely wide and includes at least as many topics as, and probably more than, those employed by the younger subjects of Jersild, Markey, and Jersild. In this latter connection, no direct comparison is possible, because the classifications are very dissimilar. Aggression, for instance, was not specifically mentioned by Jersild and his co-workers. Comparing the two sets of data as well as possible, however, it would appear that adolescents continue the trend previously noted, namely, that older children express more complicated themes than do younger children. In any event, the stories told by adolescents reflect to a remarkable degree problems of social adjustment and relations between the sexes. This result is in accordance with what might be expected from that stage of development.

To return now to the question raised above, it is well worth inquiring to what degree stories told in response to pictures represent accurately the real, everyday fantasy life of adolescents. One could follow down the list of characteristics presented above (pages 221ff) and suggest possible points of difference. One would expect that stories would be more organized and coherent than spontaneous fantasy, that they would be more subject to the demands of reality, and that the highly personalized "private" nature of fantasy would be greatly disguised in a story reported

it is repressed (or suppressed) and permitted to escape only after it has been disguised or distorted into acceptable form. Interpreting the situation broadly, we can say that unacceptable impulses may affect dreaming in one of two ways. On the one hand, they may seek outlet from the reservoir of the unconscious id (a possibility which can never actually be proved directly), or an incidental stimulus, such as the perseveration of an experience from the preceding day or an external stimulus during sleep, may set off a series of associations involving unacceptable impulses.⁷ However aroused, unacceptable impulses do not usually appear directly in the dream but rather in the disguised form of the manifest content. Thus the latter is "a make believe, a façade, which can only serve as a starting point for the association technique of psychoanalysis" (13, p. 278).

It should be remarked that one must always infer the nature of the latent content, no matter how convincing the evidence for it. One hazard of attempting to uncover it lies in the fact that analysis of the manifest content may lead almost anywhere without the necessity for assuming a prior connection, *i.e.*, the elements of the manifest content can be associated with any impulse, idea, or problem of concern to the subject. The criterion, therefore, of whether the latent content has really been discovered can only be, in the last analysis, whether or not it is convincing either to the analyst or the subject, or to both.

The third point of the theory deals with the nature of the disguising processes. It is here that Freud has made his most distinctive contribution, for the bizarre and often incomprehensible nature of dreams has been a puzzle ever since man began to think about dreams. The explanation lies in the "dream work," which transforms the latent content into the manifest content.⁸ The mechanisms whereby this conversion takes place are as follows:

1 *Condensation* The dream is "overdetermined" because the manifest content always consists of much less than the latent content. That is, elements of the latter may be omitted, or only a small part may pass over into the manifest content. More complexly, the manifest content may represent a fusion of several elements of the latent content which are similar in some way. The manifest content, as a result, is certain to be puzzling, because it cloaks the more complicated and diverse elements

⁷Note that Murphy's suggestion that the latent content is the tension system covers both kinds of contingency (18). See also the discussion by French of relationships between dreams and bodily states (7).

⁸Even experimental work on dreams oriented toward disproof of some aspects of Freudian theory agrees that the dream as the individual is aware of it, transforms the condition which instigates the dream into a story of some kind the content of which is not simply a direct statement of the stimulus.

in disguised form, and (3) that various mechanisms are utilized to evade censoring forces in the ego.*

With respect to the first point, it is necessary to clarify what is meant by "wishes." "Boiled down to acceptable terminology, the wish fulfillment hypothesis becomes a statement that dreams are motivated" (23, p. 129). That is to say, dreams have the function, according to Freud, of protecting sleep against disturbing stimuli (8). Hence a dream may occur as a response to any stimulus during sleep which is strong enough to impinge upon the field of attention. Dreams may, by extension, also have on occasion the function of catharsis, by harmlessly relieving emotional tensions.

Freud suggests that three possible kinds of stimulus may result in dreaming. In the first place, the effect of recent experiences, notably of the preceding day, may persist into sleep and arouse dreams, for example, an airplane may figure prominently in a dream after a trip by air. In the second place, the memory of infantile experiences is said to occasion dreams in later life, for example, a person may dream of a parent who died during his childhood. As Freud himself admits, this second source is very difficult to prove. Even when childhood events are discovered in dreams, the specific stimulus could just as well be some recent experience. Finally, a third source of dreams may be somatic in nature, a bodily need such as thirst or hunger, or an external stimulus. For instance, one may dream of food, or of traveling to the North Pole, and, upon awaking, find that he is hungry or that the temperature changed during the night. The main point therefore is that *something* arouses the dream, which, in turn, represents a way of dealing with the stimulating conditions. It is only natural, in keeping with Freud's central interest, that he should emphasize in dreams their relationship to dynamic problem situations in the life of the individual. In this manner, dreams can be used as clues to personality development and organization.

With regard to the second point, Freud has adduced convincing evidence that dreams usually have two aspects, which he calls the "manifest content" and the "latent content." The outstanding instances in which the latter is not necessarily different from the former are simple wish fulfillment dreams in children and dreams which more or less directly satisfy physical needs. For the most part, however, the latent content consists of impulses, emotions, and desires which cannot be expressed or satisfied directly because they are unacceptable to the dreamer, *i.e.*, because they are dangerous, immoral, shameful, etc. The latent wish, in short, is subject to a postulated censorship in the ego, as a result of which

* Since a brief outline of major points in psychoanalytic theory has been presented in Chap. 3, there is no need to repeat them here.

meaning. Indeed, the greater the secondary elaboration, the farther removed the manifest content becomes from the latent content. Gaps are filled in, objects are named and sharpened, relationships are made to conform with reality, utterly meaningless elements may drop out or be modified, etc. Secondary elaboration is best seen after waking, when the manifest content is reported verbally to another person. In converting it into words, the dream tends to become a story.⁹ For example, some kind of fearful animal in the dream may be described as a lion, or a glittering, gold, writhing dream object may become a snake, or a vague, dark, and shadowy outline may be converted into an apartment building.

Although still other processes may occur in the dream work, the foregoing are the most important of them. An understanding of them goes far toward clarifying the seemingly mysterious nature of dreams. Of course, there is wide variation in the utilization of these mechanisms, depending upon the severity of the censoring function, the acceptability of the latent content to the dreamer, and the vividness of the dream itself.¹⁰ In any case, the development of the Freudian theory has gone a very long way toward placing dreams within an orderly framework of normal human behavior. It has also revealed their dynamic, motivated character.

This view of dreams has proven to be of great assistance to the psychoanalyst. For one thing, dreams furnish a convenient starting point in the analytic situation. They provide something to talk about, especially if a dream is recurrent or troubling to the patient. The attempt to find the meaning of the dream constitutes, as it were, a problem for the patient and provides a rather natural point of origin for free association. A second advantage of dreams comes from the result of interpreting them. If a convincing meaning is discovered, or, short of that, if free associating to the dream elements uncovers material of which the patient was not aware, it serves as a reinforcement for the analyst's contention that there are hidden regions of the mind which must be opened in the course of treatment. Still a third advantage, from the standpoint of the analyst, is that dreams, as expressions of wishes (as broadly defined above), constitute clues to important conflicts, anxieties, and repressed impulses in the personality of the patient. These advantages are so great that they outweigh criticisms of the validity of dream interpretation. It is a case, of which there are many in applied science, in which, if it works, it is right. Although this statement in no way implies that the theory should be accepted with-

⁹Similar processes are observable in other situations also for example in successive reproductions of previously observed figures in the effort to remember stories and in rumor (cf Chap 16)

¹⁰Quite possibly all these factors are more significant in neurotics than in better adjusted people with the result that distortion may be correspondingly greater in dreams of the clinical patient.

which underlie it. An example of condensation would be to dream of one's boss who has the face of one's brother.

2 *Displacement* The manifest content also disguises the latent content by placing a different emphasis on ideas and emotion. "A highly significant idea is replaced by a previously indifferent and unimportant one" (15, p. 224). Displacement may be achieved by something akin to allusion, where a related idea substitutes for the really significant one, or the accent may be changed, so that an indifferent element assumes central importance instead of the significant one. For example, a married man might dream of a girl with a very pretty little dog, which is emphasized rather than the girl, who is really the central figure.

3 *Symbolization* Although closely related to displacement and accompanying it, symbolization may be regarded as an additional process, since it holds so important a place in the psychoanalytic interpretation of dreams. It is the mechanism whereby acceptable or harmless objects are substituted for tabooed or unacceptable objects. The same process is readily observable in literature and in everyday life. Thus the psychoanalytic literature abounds in instances in which the male genital organ is symbolized by objects which resemble it in shape or function, such as tools, swords, and faucets. Similarly, a queen may symbolize one's mother, etc.

4 *Regressive Representation* Dreams make widespread use of ideas, feelings, and modes of expression which are characteristic of earlier experiences in the development of the individual. Freud regards this process as a matter of expressing ideas in the form of the original sense impressions rather than in that of more recent and more elaborated derivatives thereof. As a result, the manifest content of a dream is rendered even more meaningless than it would otherwise appear. The fact that dreams typically occur in pictorial form is taken by Freud to be a regressive characteristic. Other features of regression are the freedom of time relations, the appearance of past events (such as dreaming that one is a child), and the personification of animals and inanimate objects.

5 *Dramatization* The dream is expressed in imagery and a dynamic sequence of events, rather than in coherent, logical form. In part, this is a function of the tendency toward archaic representation just mentioned. In part, too, it is a function of the free and shifting nature of autistic thinking, which makes it rapid and episodic. That is, the ideas, impulses, feelings, etc., of the dream are acted out, are expressed as events and pictures.

6 *Secondary Elaboration* The more the dreamer becomes aware of the dream, the stronger is the tendency for it to assume a coherent and recognizable form, even if it does not become any more clear in its real

additional efforts would uncover latent content not apparent in Hall's interpretations. On the other hand, Hall's subjects were presumably normal young people, and their dreams might be simpler and more direct than those of patients undergoing psychoanalysis (see page 231, note). There is no reason to believe that dreams do not reflect current conflicts, nor is such a belief counter to Freudian theory. The latter would merely seek to go back to more deep-lying motives and personality dynamics to which the dream is related. In any case, the method developed by Hall is a promising one.

Children's Dreams The dreams of children have been studied by several investigators. Blanchard (2) found that parents, animals, and fears were most frequent in the manifest content of children's dreams. Jersild, Markey, and Jersild (14) and Griffiths (10) also found a high incidence of fears. Otherwise, the range of manifest content is extremely wide, perhaps the most marked feature is the frequency of everyday events and objects associated with the usual activities of the children. There is also evidence that younger children have simpler and more direct dreams than do older children.

WISHFUL THINKING

Autistic thinking does not characterize only those situations during waking and sleeping life in which the individual is relatively detached from reality, it is also interwoven with seemingly realistic thinking. Although this aspect of the psychology of thinking will be developed more fully in the last section of the book, a preliminary discussion is pertinent at this point. If fantasy and dreams represent processes which, in typically disguised form, aim at fulfilling wishes (broadly, inner-need states), then so does everyday thinking in many other forms. Here, too, the wish may be unconscious and the manifest content of the response disguise the latent content. It should be noted here, as above, that the term "wish" refers to need, impulse, feeling—a motivational condition—rather than to the simple, naive, conscious idea implied in the traditional "three-wishes" situation. It is only upon analysis and reduction of the response to its underlying elements that the simple wish becomes apparent.

Viewed in this light, wishful thinking is clearly not just a "transitory phenomenon of childhood" (17). McHugh shows that there is a gradual increase in the ability to detect autistic fallacies when they are presented as logical problems. The condition which concerns us here, however, is everyday life, in which the entire sequence of mental processes is not consciously present, that is, the response is usually a conclusion with the premises not verbalized. Adults display this kind of thinking quite frequently.

out criticism or continued efforts at verification, it does give sanction to the analyst's use of dreams

OTHER STUDIES OF DREAMS

Before we leave the subject of dreams, it is worth considering briefly the few nonpsychoanalytic attempts to study them. This work falls naturally under three headings¹¹

External Stimuli The effect of external stimuli during sleep, recognized by Freud as one source of dreams, has been the problem of several experiments (see Sears, 23, and White, 26, for brief reviews). An example is the ingenious study by Cubberly (5). He systematically induced "tensions" in his subjects by sticking small pieces of gummed paper to various parts of the body. The opposite effect was obtained by rubbing a relaxing substance, such as oil, over a small area. According to his report, dreams invariably resulted, of which only 5 per cent could not be remembered. The dreams, although varied, showed a rather clear relationship to the induced tension or "detension." For instance, a "tensor" on the leg might result in dreams of walking, of lameness, of a threatened kick from a horse, etc.

Experiments of this kind neither prove nor disprove the Freudian theories. They indicate that dreams can be responses to external stimuli, but they do not prove that dreams can only be induced in that manner. By the same token, of course, it cannot be proven that external stimuli are unnecessary to arouse dreaming. The most reasonable interpretation is to admit of several sources of dreams.

Current Conflicts Another line of approach has been based on the hypothesis that dreams are attempts to solve current conflicts in the life of the individual (21). This view is really not at odds with the Freudian position, either, unless it is assumed erroneously that the latter invariably insists that dreams are sexual in nature and that the latent content must involve childhood events¹².

A recent experiment utilizing this approach has been conducted by Hall (11). The method employed was to collect a long series of dreams for a given subject and to analyze them as a coherent whole. Despite efforts at validation, a very considerable factor in this method, as in that of psychoanalysis, is the viewpoint of the analyst. It is entirely possible that too much reliance was placed upon the manifest content and that

¹¹ We have confined ourselves here to experimental studies uncomplicated by additional factors such as hypnosis.

¹² The mechanism of archaic representation by the way, need not imply a childhood origin for the dream, it is a manner of expression, rather than necessarily constituting the content.

regards his handiwork as almost the equal of a professional job, no matter what flaws objective observation would reveal. A book written by a local author may be judged much better than it really is. A cockroach can seem much bigger than its actual measurements.

5 *Response to Propaganda and Authority* The familiar cosmetic advertisements exemplify how propaganda appeals to wishful thinking. Regardless of its merits or true effects, a product may be purchased because it claims greater satisfaction of the wish to be beautiful than a rival product. In numerous instances also, an act is carried out or a decision reached, not in terms of the realities of the situation, but because of a wish to please someone in authority or to avoid trouble.

6 *Self-defense* Situations of this kind are frequent. In an argument, the wish to avoid defeat may lead the individual to argue in terms of his own beliefs rather than in terms of facts, or the demolishing of factual arguments may make the individual fall back upon wishful statements. Embarrassment, shame, failure, etc., may all evoke an effort to structure the situation in keeping with the way the individual wishes it were.

7 *Basis for Realistic Thinking* It is important to note that wishful thinking does not necessarily preclude realistic thinking, indeed, it may actually contribute toward it. A wish that something were so can often make a person work to achieve it. In this case, wishful thinking is a preliminary and temporary stage in working toward a goal.

CONCLUSION

In this chapter, we have discussed those aspects of thinking which are closest to the internal-need pole of thinking. In fantasy, dreams, and wishful thinking, the role of realistic factors is very much reduced, so that, in consequence, the course of mental activity is very responsive to and influenced predominantly by, inner conditions of the individual. At the opposite pole of thinking, mental activity is responsive to, and influenced by, external conditions, exemplified by problem-solving situations and formal logic. Intermediate between these extremes are mental activities, perhaps most frequent in everyday life, which combine realistic thinking and imagination, or which shift back and forth between the two poles of thought. In the next chapter, we shall deal with thinking which, in an organized manner and under rather specialized conditions, combines realistic thinking and imagination to achieve a creative product.

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The outstanding characteristic of wishful thinking is the seemingly factual and logical form in which it is couched. The most deceiving feature is the fact that wishful thinking is expressed in words, either overt or subvocal, words provide a definiteness of structure, an apparently acceptable meaning, as a result of which the wishful element is effectively concealed.

Perhaps a few examples will clarify the nature of wishful thinking.

1 Escape A very familiar form of wishful thinking occurs in unpleasant or frustrating situations. An individual may escape from them by going to the movies by reading, etc. The fairy-tale atmosphere and happy ending of a movie arouse in the individual a response equivalent in its simplest terms to the statement, 'I wish that my own life were like that.' For a brief period, at least, his own life *is* like that. Often, also, an unpleasant situation may be at least partly avoided by a judgment that it will ultimately turn out for the best, equivalent to the wish that it will do so. There is a difference between utilizing this kind of mechanism as a means to calm anxiety in order that the problem may be tackled more effectively and employing it as a means to avoid facing the problem.

*2 Explanation in Ambiguous Situations*¹³ Superstition is an excellent example of how wishful factors shape response (cf. 6, 27). Here the basis is a need to explain an otherwise incomprehensible phenomenon. The same is true of myths and legends (3, 12). The war provided numerous ambiguous situations in which explanation was sought in wishful thinking (4). Accidents and other temporary and sudden phenomena in which direct perception of the facts is impossible often arouse responses which seek to explain what happened.

3 Interpersonal Relations In love affairs, one person may endow another with qualities which he or she wishes the other had, the same is true in relations between parents and children. Indeed, wishful elements enter into almost any situation involving people. How often, for instance, in discussions of controversial issues is it assumed that the other person shares one's own political, religious, economic, or social convictions? The mechanism is likely to be, "I wish that everyone saw it the way I do."

4 Distortion of Reality The environment is continually shaped as much by personal needs as by objective, realistic considerations. Letters are written to a newspaper protesting the removal of a familiar old tree, despite the fact that it constitutes a traffic hazard. An amateur carpenter

¹³ McGregor (16) suggests that wishful factors are of slight importance except in ambiguous situations. His conclusion shows the risk in placing too much reliance on a mere word perhaps ambiguity *vs* nonambiguity could be defined in such a way as to cover all the conditions that we are here outlining.

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extent, have different mental processes. However, there is no need for this to be the case. Rather, the creative thinker is directing his mental activity to a different end from that of the ordinary person, or, putting it another way, he more often deals with, and cultivates creative situations in his everyday life. There is no reason to suppose, however, that the artist's or the scientist's thinking is different in kind from that of the nonartist or the nonscientist in corresponding situations. Nevertheless, it is obvious that the characteristics of creative thinking, if such there be, ought to be found most readily in those persons who most often are said, according to some standard, to engage in it. This explains the dominant emphasis on the artist, although scientists, mathematicians, and others need to be included among those who most often find themselves in recognizably creative situations. The mystery can only be resolved by objective study. We shall return to this problem of the differences between artists and nonartists, scientists and nonscientists, etc., a little later, after we have considered the creative situation itself.

PROBLEMS IN THE PSYCHOLOGY OF CREATIVITY

Before continuing any farther, it is necessary to examine the kinds of problem which are presented in the creative situation, in order that the emphasis in this chapter will be clear. At least six aspects of creativity are of concern to the psychologist, as follows:

1 *Personality of Creators* Interest in art, science, and other fields of creative thought has led to numerous attempts to probe the nature of the artist, scientist, etc. This approach ranges from biography to more nearly case-history material, as the psychologist conceives it. Sometimes investigation of this kind has concentrated on some particular aspect of personality, sometimes a comprehensive analysis has been attempted. Several examples of psychologically oriented studies are Freud's *Leonardo da Vinci* (12) in its way a little masterpiece of psychoanalytic literature, sketches of the personality of Marcel Proust by Heider (17) and of Franck and Weber by Squires (44, 45), and briefer portraits of many American artists by Roe (39). The focus of attention in these studies is on what has made the creator what he is and, to a greater or lesser degree, how personality structure and dynamics influence the creative product.

2 *Development of Creative Ability* This problem, of course, is related to the foregoing one, the principal difference lies in its emphasis on the development of children. Although very little is, in actuality, known about this aspect of growth (38), it is of great importance for an understanding of creativity. At the present time, more is known about the measurement of creative ability, and about mental growth generally,

Chapter 12. CREATIVE THINKING

There is one other form of thinking which is usually linked with imagination, namely, creative thought. It has aroused more wonder, perhaps, than any other kind of thinking. The reasons for which it seems so miraculous and mysterious are not difficult to see. In the first place, the products of creative thinking, accumulated slowly through the ages, are themselves marvelous—remarkable in their construction, meaning, perfection, and emotional stimulation. Even the creator, as well as the observer, has been fascinated with the question of what mental processes could have led to the final product. In the second place, the kind of thinking which precedes a work of art or the formulation of a mathematical principle seems to be so different from everyday thought, which does not lead to such results, that the ordinary person cannot really understand it and hence assumes that the thought processes responsible must be incomprehensible.

It must be confessed at the outset that the psychologist himself has not as yet penetrated the mystery very deeply, either. The problems are extremely difficult to approach in an objective and significant manner. On the other hand, enough work has been done to permit us to sketch at least the broad outline of creative thought and to formulate directions in which further investigation might prove fruitful.

Part of the mystery is removed when the two confusions suggested above are clearly distinguished from each other and the resulting psychological problems are clarified. The first confusion rests in the failure to differentiate between the product of creation and the mental processes which precede it. The wonderful features of the former seem to demand wonderful properties in the latter. Although a work of art may be of the highest quality, as different as possible from everyday experience, the mental processes which led up to it may actually be no different in kind from those which produce ordinary results. Hence in the discussion to follow, we shall in no way reduce the excellence of the products of creative thought or belittle the superior quality of the mental activity which goes into them by attempting to discover the nature of that activity.

The second confusion was stated as one in which the unusual characteristics of works of art and other creative products seem to require that the artist himself be essentially different from other people and, to that

extent, have different mental processes. However, there is no need for this to be the case. Rather, the creative thinker is directing his mental activity to a different end from that of the ordinary person, or, putting it another way, he more often deals with, and cultivates creative situations in his everyday life. There is no reason to suppose, however, that the artist's or the scientist's thinking is different in kind from that of the nonartist or the nonscientist in corresponding situations. Nevertheless, it is obvious that the characteristics of creative thinking, if such there be, ought to be found most readily in those persons who most often are said, according to some standard, to engage in it. This explains the dominant emphasis on the artist, although scientists, mathematicians, and others need to be included among those who most often find themselves in recognizably creative situations. The mystery can only be resolved by objective study. We shall return to this problem of the differences between artists and nonartists, scientists and nonscientists, etc., a little later, after we have considered the creative situation itself.

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than about creativity and conditions which promote it. The insight afforded by projective-test results may prove valuable in this connection, and the problem of spontaneity, which we shall discuss later, has considerable bearing on the development of creative ability.

3 *Artist versus Nonartist*¹ We have mentioned this third problem above. If the confusions involved are set aside, then it becomes important to compare objectively the behavior in creative situations of artists and nonartists. The question may, of course, be further extended to the two preceding problems and must ultimately be related to them. A considerable amount of the literature dealing with all the problems under consideration either explicitly or implicitly expresses a distinction between artist and nonartist.

4 *Psychological Principles Applied to Artistic Products* In this fourth problem, the search is for psychological understanding of the creative product. For example, gestalt concepts of perception have been applied to works of art (4, 5, 23). Other attempts at a comprehensive psychological analysis of creative products include Seashore's treatise on music (42), Meier's book on painting (27), and Chandler's volume on these and other arts (6).

5 *Experimental Aesthetics* This problem is related to the one above, the emphasis, however, is on the effect of the work of art on the beholder, and secondarily on the product, as such. Studies in this field have been reviewed by Woodworth (49). Discussions of the enjoyment of art include those by Langfeld (24), Ogden (33), and Chandler (6). Koffka's paper also goes intensively into problems in this area (23).

6 *Mental Activities in Creative Thought* Here the problem is to determine what goes on during the course of actually achieving a creative product. Our principal concern in this chapter will be with this aspect of creativity. It is unfortunate that we must limit ourselves in this fashion and call merely upon data bearing upon the other problems as they have direct relevance to our central interest. In no sense should this selection be construed as an indication that the author deems the sixth problem to be more important or more interesting than the others. It is simply that the intent of this book is best satisfied by adopting this policy.

It should be noted that we have differentiated, in this manner, between the mental activities of creative thought and those associated with response to the product itself. The latter is often called "appreciation." From the standpoint of imagination, as we have formulated it, the development of the product may be regarded as akin to fantasy, and ap-

¹We use the words "artist" and "nonartist" here, as elsewhere, because they so obviously connote creativity and noncreativity. It should however be kept in mind throughout that creativity is not assumed to be limited to the arts.

preciation as akin to play—or perhaps the latter, the situation in which a person is confronted with a work of art, might be regarded as analogous to that of the projective-test situation

THE CREATIVE SITUATION

More than imagination is involved, however, for we conceive a creative situation to be one which combines realistic thinking and imagination. It has many of the characteristics of both problem solving and fantasy. It is a kind of problem solving without any predetermined or "correct" solution and with self-expression or externalization as its dominant feature. It resembles fantasy by calling upon the 'free reorganization of past experience' and by being influenced more by inner need states than by external demands, but it differs from fantasy because it is under far greater voluntary control' (at least during a large part of the mental activity) and because it becomes externalized and eventually results in some tangible final product, which, however, unlike a typical problem solution, is a new or more satisfactory achievement.

Many complexities present themselves, which may be defined to some extent as variables. For instance, the factor of newness or satisfaction can vary between wide limits, and the degree of voluntary control can range extensively. Similarly, creative activity at times may be almost a simple problem situation, as described in Chapter 9, at other times it may be almost a fantasy or a dream, which is later reproduced in some form.*

Let us consider this last variable more carefully. A creative situation may arise from an external stimulus. For example, an artist may be given a commission to paint a mural, or a composer to write a cantata. By the same token, as we shall see, creative situations frequently arise in everyday life, too, usually from the occurrence of a problem in the environment. On the other hand, the situation may have what appears, at least, to be an internal origin. A dream may suggest images to a poet or a plot to a short-story writer, or the theme for a play may emerge with apparent spontaneity into the consciousness of a playwright. Regardless of its origin, however, a creative situation resembles a problem situation as soon as the effort commences to achieve the final product or to convert the feelings, images, plots, etc., into a tangible medium.

These considerations apply rather specifically to the activity of creating a particular product. There is a broader condition, too, which needs to be mentioned. The creative situation may also be regarded as a continual state of the creator in a particular field (cf Murphy, 31). That is to say,

*Fairbairn (11) conceives of art as "restitutive" and compares the work of creating an art object to the dream work. According to our view, however, this pertains to only one aspect of creativity, the imagination aspect.

the person whose aim in life it is to create, whether painter, composer, inventor, scientist, is creating, not only a particular object, but a life work. In this sense, then the instigating factor is a continuing need for self expression, or self realization, although a specific stimulus or a problem may be required to channel in some particular direction the individual's efforts at satisfaction of the internal-need state. In this same connection, there is apparent a third source of confusion in the study of creative processes. It is necessary to distinguish in creative thinking between that sequence of events associated with the evolution of a particular product and the successive stages in the developmental history of the individual creator, of which a given creative situation is usually only a momentary part.

Many students of art are understandably reluctant to define a creative situation merely as a problem-solving process. We concur with this view, for, as pointed out above, it also has characteristics which we have linked with the imaginative pole of thought. The person who criticizes the view that creation is problem solving no doubt seeks to emphasize the freedom from habitual modes of thinking and the necessity for free recombination of past experience which is more typical of imagination than of realistic thinking. Nevertheless, creative thinking can seldom, if ever, be solely fantasy, for it is directed to a definite and tangible outcome in the work of art, or the mathematical principle, or whatever. At some stage, then, unlike in fantasy, the creator must be guided by the nature of the medium with which he is dealing, by the demands inherent in relating one part to another, and by the tangible organization of the final externalized product.

Thus creative activity can best be understood if it is defined as a combination of problem solving and imagination. In a creative situation, a problem arises and effort is directed to achieving a solution of some kind, but the activity of reaching the solution is governed more by autistic factors than by realistic demands, and the intervening mental activities may resemble fantasy more than problem solving. The final product is not so much a correct solution as one which in some measure satisfies the internal needs of the creator.²

When creative situations are so defined, it is evident that they occur in many fields other than the arts. Some difficulty in terminology therefore results since the term "creative thinking" connotes in most people the work of the artist. If it is understood that we refer to creative situations wherever they occur, rather than only to those in the arts, the ac-

² Cf. Gotshalk (14), who approaches the creative process in a somewhat similar fashion. Dewey (9) also appears to hold similar views and Koffka (23) suggests the same point.

tivities to be discussed below will be placed in their proper context. It is of course possible to evaluate the products of scientific, artistic, and other creative thinking by different criteria, *e.g.*, according to whether they are additions to knowledge or to enjoyment, etc. This further problem will not concern us. The general aspects of the thinking which occurs in all kinds of creative situations appear to be well enough established in various fields of endeavor so that we can, in the present context, ignore value judgments

PHASES OF CREATIVE THINKING

Despite the highly individualized creative activities revealed in intensive analyses of individual creators, several general aspects of creative thinking have been identified. Impetus to the conception that creative thinking typically passes through a series of rather well defined stages came from introspective reports by Helmholtz (18) and Poincaré (37), each of whom described his own thought processes while pursuing the answer to an original problem. Helmholtz specified a period of initial investigation of the problem until further progress was impossible, then, following a period of rest and recovery, a possible solution would occur to him in an apparently sudden and unexpected manner. To this sequence of events, Poincaré added the requirement for a second period of conscious work, following the inspiration or illumination. Both these scientists emphasized the role of unconscious activity, especially in the second period prior to the illumination, many subsequent writers also have stressed this side of the total process, as will appear subsequently.

Wallas (47) gave to these aspects of creative thinking the names "preparation," "incubation," "illumination," and "verification," the terms by which they are generally known today. The experimental studies presently to be reviewed have been based essentially on this formulation. Dewey's analysis of reflective thinking (8) corresponds closely with it also. The process, he says, originates in a disturbance of some sort—perplexity, doubt, confusion, or simply the occurrence of a need or problem. There follows a period of searching, inquiring, and development of suggestions for solution of the problem. From this activity, the problem emerges more definitely, after which successive hypotheses or suggestions are used to assemble material bearing upon the problem. In the next period, the reasoning period, elaboration of a possible solution occurs, and, finally, it is tested, either by overt or by imaginative action. Dewey's scheme, to be sure, is more that of the disciplined thinker or reasoner than that of the creative thinker as ordinarily conceived. Nevertheless, it is important to note that the stages which he finds are very similar to those discovered in other fields.

Let us consider now the evidence for the four alleged stages of creative thinking. Several experimental studies have been made, and considerable introspective data exist, especially with reference to the third, or illumination, stage.

Detailed and elaborate experiments have been carried out by Patrick (34-36). Her intention was to devise a laboratory situation in which the subjects actually engaged in creative thought and to record the manner in which it occurred. She has successively investigated the writing of a poem, the painting of a picture, and the solution of a scientific problem. In the last experiment, no attempt was made to include professional scientists, but in each of the other two, the subjects consisted of groups of professional poets and artists and control groups of nonpoets and nonartists. In the poetry experiment, 55 poets and 58 control subjects participated, and in the painting experiment, the two groups numbered 50 each. In both instances, experimental and control subjects were well matched in intelligence, sex, and age.

The general procedure was to present each subject individually with a stimulus, in response to which he was to create the requisite object. In the case of the poets, a landscape painting was employed for this purpose, for the painters, it was a portion of Milton's "L'Allegro." The subject talked aloud and worked without a definite time limit. The experimenter observed the performance of the subject and wrote down his running commentary verbatim. The data were recorded in five-minute intervals, a technique which later permitted the experimenter to trace trends through the working session. In addition, answers were obtained to a questionnaire which covered methods of work. A variation was introduced into the scientific-thought experiment. In this case, one group of 50 subjects planned an experiment in one sitting, and another group of 50 kept diaries for two weeks, during which they thought about the problem. Patrick's method thus has the advantages of employing many subjects under standardized conditions and of obtaining data during the actual course of creation. On the other hand, it has some serious limitations, which will be considered later.

Patrick examined the protocols for evidence which would support the nature of the four stages previously mentioned. In order to make possible some kind of statistical treatment, she arbitrarily divided the total time spent by each subject in the experimental session into four quarters and then sought to determine what kind of activity was most typical of each. The results were as follows:

1. *Preparation* In accordance with the hypothesis that the first period of thought in a creative situation is characterized by exploratory and

familiarizing behavior, she found that "thought changes" occurred most frequently during the first quarter.

✓ 2. Incubation. Objective evidence for the second stage was sought in the incidence of recurrence at a later stage of work of an idea which finally became incorporated as a dominant theme in the final product. This phenomenon occurred in a substantial majority of the cases, thus indicating the existence of incubation. Further support came from the verbal testimony of the subjects. Patrick does not attempt to locate the period of incubation in the sequence of events, other than to say that it follows preparation. The fact that her subjects composed their poems or painted their pictures all in one relatively brief period would probably reduce incubation to a bare minimum and make this period very brief.

✓ 3. Illumination. The presence of illumination was related to the period in which the lines of the poem were first written, or in which the general shapes of the picture were first drafted. In both situations, these activities took place predominantly in the second and third quarters of the session. Patrick interprets this result as indicating that illumination "occurs when the mood or idea which has been incubating becomes definitely related to a specific goal" (34).

✓ 4. Verification. The fourth stage of creative thought, by definition, should be one in which the materials developed in the illumination period are worked over, criticized, elaborated, and smoothed out. Patrick found that the bulk of the revisions were made in the fourth quarter, thus bearing out the hypothesis. The first three stages were found also in the experiment on scientific thought, but the nature of the problem appeared to preclude evidence on the fourth.

Other investigators who have also analyzed creative thinking in terms of these stages include Rossman (40), who examined the methods of 710 inventors by means of a questionnaire. His formulation, however, is presented in terms of seven steps, very similar to those suggested by Dewey (8). Hutchinson (19-22), by employing numerous illustrations from the reports of artists, further elaborates the nature of the four stages. Hadamard (16) has taken the article by Poincaré as a starting point to examine the creative thought of mathematicians and reaches conclusions similar to the other investigators.

Although they are widely accepted, Patrick's experiments have a number of serious limitations. In the first place, it is doubtful that a single brief session (in the poem experiment, the time averaged twenty-one minutes) is really typical of a creative situation; it would appear more natural to allow as many sessions as the subject required. In the second place, the conditions of the experiment were very narrowly specified

in other ways. The task was explicitly stated and the available materials, particularly in the case of the painting, were very limited. In the third place, the talking-aloud method may be criticized. It is even more doubtful in this situation than in problem solving or concept formation, etc., that the overt verbalization corresponds closely enough to the covert mental processes to be relied upon. In the fourth place, the arbitrary definitions and statistical procedures utilized by Patrick appear very much to oversimplify the results. It might be said that she depended too much upon a priori conceptions of creative processes. In truth, it is quite possible that no laboratory experiment could be expected to represent a natural creative situation.

An experiment was conducted by Lindhoven (10), in an effort to overcome some of the limitations in Patrick's research. The task was to paint a picture which would serve as a "publishable illustration" for a poem. The subjects were a group of 13 professional artists and a control group of 14 nonartists; the two groups equated for sex, age, and intelligence.

The chief problems were to devise conditions which would increase spontaneity and naturalness in the painting situation and to avoid strict dependence upon verbal report. To the latter end, the experimenter sat in a position in which he could unobtrusively observe, time, and record the subject's actual behavior; in addition, all the work done during the experiment was available for later analysis.

Several devices were used to increase freedom of expression. Time restrictions were kept at a minimum. The subjects were allowed as many visits to the laboratory as they desired, to a maximum of four. Almost all subjects, in fact, came for more than one period, although relatively few came for all four. A variety of materials was available, namely, four monochrome media—black drawing pencils ranging from hard to soft, charcoal sticks, India ink with pens ranging from fine to wide points, and black poster paint with brushes of various sizes. The stimulus poem, too, was relatively "unstructured" and abstract, and presented a variety of fanciful and unusual images.

The subjects, as in Patrick's experiment on scientific thought (36), were supplied with drawing paper and a pocket notebook, to use for ideas relevant to the project which might occur while they were away from the laboratory. Although few subjects actually used these diary materials, invaluable data for understanding the creative activities of at least one subject were obtained.

The results of the experiment considerably amplify those obtained by Patrick. A brief summary of them therefore follows.

1 *Time Relationships* If the creator is given the opportunity to choose as many sessions at the task as he wishes, it is apparently typical for creation

to extend over more than one period, with considerable variability in this respect among individuals. Most of the time in all the laboratory periods was spent in actual sketching, more time was spent in the first period than in later sessions in reading the poem. When the first sketch in a series was compared with the final sketch,⁴ it was found that artists spent very little time on the former and much more time on the latter, the nonartists tended to spend the same amount of time on both.

2 Products of Creativity It was typical for the subjects to produce more than one sketch, artists tended to make more sketches in early than in late stages, whereas nonartists made as many sketches in late as in early stages. Sketches varied considerably in size, with artists showing a change from very small sketches in the first period to larger ones in later periods, but nonartists tended to produce very large sketches during all periods. With respect to placement of sketches, those of the smallest size were usually off-center, those of largest size were centered. Artists more often used pencil for small sketches in the first period and brush for larger sketches made later, nonartists more often used brush for early sketches and pen for later ones.

Various aspects of painting were traced through the sketch series, that is, each sketch was compared with each later sketch to determine whether the factor in question was similar or dissimilar in the two instances. In general, the motif appearing in the first sketch was repeated in later sketches, whereas subject matter, composition, the number of objects, and the size relationships of elements in the picture were often dissimilar from sketch to sketch. Artists usually employed the same style throughout the series but varied the activities portrayed, whereas nonartists reversed this pattern, *i.e.*, varied their style but repeated the activities shown in early sketches.

Thus Lindhove's results go beyond those of Patrick in two principal ways. In the first place, artists are seen to differ strikingly in their manner of painting from nonartists, and important additional light is cast upon the nature of the four alleged stages of creative thought in relation to the final product.

REVISION OF THE CONCEPT OF STAGES

The real weakness in the view that creative thinking consists in a sequence of fairly well defined phases is not that these stages do not exist but that they are regarded as universal, clearly recognizable, suc-

⁴Not all subjects achieved what they regarded as a "publishable" sketch; those selected as publishable were not always final sketches; however, the results for comparing initial and publishable sketches are very similar to those comparing initial and final.

cessive, and distinct from each other. In actuality, it would be better to conceive of creative thinking in more holistic terms, a total pattern of behavior in which various processes overlap and interweave between the occurrence of the original stimulus and the formation of the final product (cf Wertheimer, 48)

In this regard, let us consider more carefully those aspects of creative thinking which have been called "incubation" and "illumination," which we prefer to define as processes rather than successive periods. In Eindhoven's experiment, nearly all the subjects came to the laboratory more than once and produced more than one sketch. At what point could it be said that illumination took place? There were, rather, a *series of illuminations*, which began in the first sketch and continued throughout the series.⁵ That is, the plan for the publishable or final sketch sometimes appeared in the first sketch, sometimes later, after a series of experimental sketches, more typically, perhaps, it evolved gradually, so that the final sketch combined many illuminations. The fuller view of illumination, which we are presenting here, is clearly exemplified in Eindhoven's analysis of various aspects of the picture, previously mentioned, that is, the plan for a painting includes motif, subject matter, composition, style, etc. Any of these, or a combination of them, may be involved in any single illumination. Decisions regarding none of them were reached exclusively at any stage of the painting process. Nor is it possible to consider each separate sketch as an embodiment of the four alleged stages, since they represent for each subject parts of a more inclusive whole, the evolution of the ultimate product.

Incubation, similarly, does not occur at a particular stage rather sharply differentiated from preceding and succeeding stages. Rather, incubation appears to operate, to varying degrees, throughout the creative process. By definition, one would suppose that incubation took place, in Eindhoven's experiment, predominantly between laboratory sessions, on the other hand, nearly all his subjects painted more than one sketch in at least one period, so that incubation can be said to have occurred during any period in which more than one sketch was made (this condition existed for every period in both groups, except for the fourth period in the artist group, since only one of the latter came four times). As a matter of fact, incubation might be said to occur, if only briefly, continuously during the preparation of a single sketch, as, for instance,

⁵In the case of one artist a classical illustration of illumination occurred. She had an idea, suddenly, for her publishable sketch while at home, and simply reproduced and elaborated it in later periods. Incidentally, one artist never did have an illumination of any kind pertaining to the problem but simply sketched the experimenter. One nonartist was totally unable to sketch, even with the experimenter out of the room.

when the outline of an object is drawn, then attention is given to some other part of the picture, and later it is shifted back to the earlier activity, etc

Other studies, incidentally, which have analyzed in considerable detail the creative thought of individual artists further confirm the belief that creative processes run parallel, interweaving courses. The best known of these are the studies of the poet Coleridge by Lowes (25) and Nethercot (32), the analyses by Spurgeon and by Armstrong of the imagery in Shakespeare's plays add further evidence (43, 3). The composing of a poem may involve an extremely intricate interplay between the reservoir of memories and the deliberate formulation of phrases and lines, the whole process continuing over a long period of time, during which the future poetic materials are accumulated. According to Lowes and Nethercot, *The Rime of the Ancient Mariner*, *Kubla Khan*, and *Christabel* did not emerge suddenly, or completely, but were gradually developed by Coleridge, with many incubations and illuminations. Many of the introspective reports gathered by Rossman (40) from inventors similarly indicate that creative thought in invention is more often a train of inspirations and incubations than one of sharply defined stages.

The other two periods, preparation and verification, can be similarly conceived as continuing processes rather than stages. In Eindhoven's experiment, preparation can be said to have occurred at the start of each laboratory period and at the start of each sketch, as well as in the very first period. In the picture unfolded by Lowes and Nethercot, preparation in the work of Coleridge did not cease after the poems were begun but actually seemed to continue to the end, when Coleridge was still having new ideas. Verification, by the same token, accompanies early, as well as late, stages in the creative process. An illumination in a preliminary sketch, for example, may be followed up, criticized, refined, and carried throughout the sketch series.

Thus it is necessary to conceive of creative thinking in terms of dynamic, interplaying activities rather than as more or less discrete stages. Preparation, regarded as the process of recognizing and formulating the problem and having ideas about its solution, may lead to some preliminary decision, a kind of illumination, and an effort made along that line. This same action, however, may serve as preparation for a later stage of development. Incubation may follow illumination, as well as precede it, that is, the individual may not think consciously about the problem following an illumination which has actually resulted in setting down an idea, but resume it later. Even when the product is in the final stages of refinement, or elaboration, or polishing (verification), incubation may occur between two attacks on the problem.

Formulated in still broader terms, as Hutchinson (20), Murphy (31), and others have shown, a particular creative situation is but a tangible focusing of creative thought, drawing together at one time and to one purpose all four processes. The artist has been collecting materials for expression during his entire lifetime up to that point (preparation), and these materials have become part of the unconscious equipment of the individual (incubation). These ideas or related ones have reappeared many times in new contexts and in new organizations (illuminations) prior to a given creative situation, and the artist has previously acquired the techniques and refined skills of this method of expression (verification). The four aspects of creativity overlap and intermingle. In a particular creative situation, they are almost simultaneously evoked in the creator, so that he is really preparing, verifying, having illuminations, and incubating (or at least calling upon previous incubation) all at the same time. Particularly does this nature of creative processes become clear when time restrictions are lifted and, instead of regarding creative thinking as occurring within the confines of a single sitting and a single attempt, it is permitted to take place over an indefinite period of time, as appears to correspond more with the natural conditions under which it is carried on.

We may now go a step farther in relating creative thinking to other aspects of thinking. We have presented a generalized conception. It should not be taken too literally, any more than any other conception. There is nothing in the analysis set forth above to preclude wide individual differences in the pattern of creative thinking. At one extreme, creative thinking may conceivably be very little except problem solving. An artist, as well as an inventor or reflective thinker, may set himself a definite problem and proceed to solve it according to disciplined and controlled application of techniques and hypotheses. At the other extreme, creative thinking may be of the intuitive and inspirational variety traditionally associated with creative endeavor, in this latter case, quite possibly, the sequence of events outlined by Wallas, Patrick *et al*, could be found. Thus in creative thinking as in problem solving, one might expect to find instances of essentially trial and error procedure, insight, and gradual analysis, and combinations thereof. The processes of combining realistic thinking and imagination, which we call creative thinking, may be said to vary, therefore, between the two poles previously defined. For instance, at the realistic pole, an artist may be given a commission to do a portrait. He may paint the picture by applying his skills with a minimum of free organization of experience and with a minimum of autistic involvement. At the other extreme, a fantasy

or a dream may provide the impetus and content for a painting and the creative work may be very similar to the manifest content of a dream. In one case, a creator may be guided predominantly by external stimuli and realistic demands, maintaining for the most part continuous and direct contact with the outside environment, in another case, a creator may predominantly be responsive to, and guided by, his internal needs and freely operating mental activities. More typically, in all probability, creative processes run an intermediate course, varying between the two poles and intricately combining realistic and autistic factors.

Moreover, there may be many variations in the manifestation of the four processes of creative thinking. For example, the literature is replete with striking examples of illumination (cf. 19). There can be no doubt that it may occur in the way demanded by the theory of successive stages, so that allowance must be made for this variation also. As we have noted above, incubation, too, may vary, preceding illumination, or following it, or both. Similarly, polishing (or verification) and preparation may occur at various stages and in various relationships to other processes.

Hence, at least until further investigation of the psychology of creative processes affords a different understanding of them, it appears that they are interweaving activities, occurring in highly individualized and varied patterns. A particular creative situation is but one temporary period in which all four processes are drawn together in relation to a particular object of creation.⁶

THE ARTIST AND THE SCIENTIST

Certain groups of people engage in occupations which label them as creative, among them especially artists and scientists. We do not wish, however, to employ a general term such as "creators" to describe them, because creativity is not at all confined to them. On the other hand there is a widespread conviction that the artist and scientist, although not in the same way, differ fundamentally from the nonartist and the non-scientist. This thesis has been more fully developed with respect to the artist, perhaps because *art qua art* has more often been written about and because the scientist is essentially a modern phenomenon, and hence has not yet acquired so much tradition. Still another possible reason is that the average person comes much more directly into contact with the work of art than with the individualized work of science. Let us first consider the alleged differences between the artist and the nonartist.

*Guilford (15) plans to conduct a factorial study of creativity. Using a number of hypotheses regarding creative abilities he proposes to investigate scientists and inventors in order to isolate the essential features of creativity.

Three major kinds of difference between artists and other persons have been suggested, namely, in personality, in perceptual-emotional characteristics, and in training and skill.¹

With respect to personality, there is no reason to suppose that artists, as artists, are different from nonartists. The detailed case studies of Roe (39), for instance, indicate that "there are no personality or intellectual traits and no constants in their life history which characterize them all and set them off from other persons." Undoubtedly, artists undergo experiences which influence their choice of career and the nature of their work, but similar conditions can be found in nonartists and their creative activities cannot be ascribed to any one set of circumstances.

There is better evidence for the second difference. For instance, some studies show that artistic children have greater perceptual sensitivity and facility than other children (46). This is supported by at least some studies with the Rorschach (2), which show, however, that perceptual sensitivity is probably a usual, rather than universal, characteristic of artists. It is a reasonable hypothesis that it is not so much greater sensitivity that characterizes the artist as an interest in perceptual experience and a utilization of it, and this interest is probably acquired and fostered rather than inherent.² The same suggestion may be made with reference to emotion. It may not be a matter of differences in degree or kind of emotional response but of the manner in which emotion is developed and used by the individual. The nature of the artist's task is such as to make his own emotions and perceptual responses the materials of his trade. An important part of the artist's training is learning to perceive the world and to externalize his emotional experiences. Perhaps the same potentialities exist in nonartists, but they are likely to be incidental to, or even deleterious to, the cultivation of other skills.

Finally, the most patent difference between artists and nonartists lies in their performance in particular kinds of creative situations. That is to say, the quality of the creative products is different (Patrick, 34, 35, Lindhoven and Vinacke, 10). The painter can paint a better picture, the composer make a better piece of music, etc., than can the nonpainter, the noncomposer, etc. Although this statement appears obvious, it is

¹ Meier (27) lists six "components of artistic aptitude — manual skill drive (persistent energy output), general intelligence, perceptual facility, creative imagination, and aesthetic judgment. None of these necessarily represents an exclusive characteristic of the artist.

² This statement should not be taken to mean that there are *no* biological factors predisposing an individual to artistic endeavor and success. Rather, we are still very ignorant of such factors and must say that there is no convincing evidence for a general biological characteristic, or group of characteristics, which distinguish the artist, as such.

less so when it is pointed out that very similar creative processes are found in both artists and nonartists. What accounts, then, for the better products of artists? The factors do not appear to lie in fundamentally different personality, sensitivity, etc. Rather, the difference may be predominantly a function of training. No matter how original or valuable a creative conception, it cannot result in a work of art (or a mathematical formula or an invention) unless its originator has the requisite skills to convert it into tangible form. Part of the difference in training is therefore practice in the proper use of media and in the techniques whereby desired effects may be obtained. Part of the difference is also, probably, in methods of work. In Eindhoven's experiment, for instance, artists typically made rapid, small pencil sketches to try out an idea, whereas nonartists did not. This greater facility of the artist probably reflects training in methods of developing a picture. Still a third aspect of training, already suggested above, is that the artist may have more practice in, and make more use of, perceptual and emotional response.

If, then, the major differences between artists and nonartists have to do, on the one hand, with the manipulation of perceptual and emotional response (perhaps developed through practice) and, on the other hand, with training in the techniques of expression, it would appear that creative thinking, as such, is not the sole prerogative of artists. Indeed, it is mainly, if not only, in the area of special competence that the difference appears. Thus a painter may be no better a composer than a composer is a painter.

Similar considerations apply to scientists vs nonscientists. There is no reason here, either, to suppose that the former differ as a group from the latter as a group in personality characteristics. It is rather in particular patterns of training and skill, probably, that the scientist would be expected to differ from the nonscientist. Furthermore, the scientist would, of course, be confronted more often by—and would more frequently seek out—the creative situations characterizing his field of interest.

Perhaps the most outstanding trait attributed to the scientist by others goes under the name of "scientific thinking." It would be difficult to define exactly what is meant by this term. Certainly, one element is the magical property that we discussed at the beginning of the chapter, which reflects ignorance of how the scientist deals with his special problems. Another element may be bound up with the modern reverence for science, together with the glamour, paraphernalia, and infallibility of the laboratory—that place where the mysteries of nature are rendered simple. Still another element, and also a function of modern admiration for the scientist, is the conviction that scientific thinking is rational, the "good" kind of thinking.

nize and use his emotional and autistic responses. That is, there must be some degree of freedom in mental activity, an ability to reorganize experience with relative independence of external restraints. Contrasting with this function is that in which the individual is not free in his mental activity but controlled by definite patterns, rules, habits, etc. It will be recognized that we have already touched on this latter condition in Chapters 8 and 9, where the influence of rigidity, perseveration, and habitual modes of thinking was briefly indicated. Let us call the latter function "conformity" and the contrasting function "spontaneity." We mean by conformity something like what Allport (1), Chin (7), and other investigators of conforming behavior mean. Their studies dealt with social phenomena, in which the randomness of behavior is considerably reduced, with the result that persons tend to do the same thing in the same way, in accordance with some recognizable demand, or custom, or law, etc. We mean here to define a condition in the thought processes of the individual according to which he reproduces previous experience with little variation or modification, or tends to deal with successive situations in essentially the same way, or responds to the external environment in fixed ways.

It is apparent that artists, as well as nonartists, vary widely along this hypothetical dimension, both in their own creative activity and in their thinking in other situations. For example, a painter may reproduce in a drawing a scene almost exactly as it exists in nature, merely utilizing techniques of portraying perspective, etc., to accord with the two dimensional limits of his paper, or a painter may reproduce with slight variation the same theme over and over, showing a lush meadow, let us say, with cows and a brook. Or a scientist, pursuing some line of research may put to test, according to familiar and established procedures, a hypothesis already formulated in the literature of his field. Similarly, in everyday life the individual may solve all his problems and satisfy all his needs in routine fashion, merely by utilizing the operations which he has already learned or by imitating what other people do.

In creative activity, on the other hand, experience is manipulated (preparation and incubation) and reorganization, either gradually or with seeming suddenness, ensues (*illumination and verification*). This function of spontaneity is well illustrated in studies of individual artists and in the studies of productive thinking by Wertheimer (cf., for instance, the analysis of Einstein's thinking, 48, Chap. 7).

These variables are not yet well understood. It is not even certain that conformity and spontaneity, as here formulated, represent extremes of the same dimension, *i.e.*, they may be different variables or many variables.¹⁰ Nor is it known clearly what factors promote conformity and

¹⁰ Also note that spontaneity may occur in several different forms (30)

In any case, the conception that the scientist thinks in some special way is not borne out by such evidence as we have (8, 16, 18, 36, 37, 40, 48). Rather, the thinking of the scientist is characterized by the same processes as are found in artists—or in anyone in a creative situation. The difference from the nonscientist lies in the quality of the resulting product, the training and special skills required, and the frequency with which creative situations are presented to, and recognized by, the individual. It is probable, therefore, that our formulation of creative thinking applies as much to the scientist as to the artist, except, of course, for differences in the kinds of problem situation involved. There is no need to assume unusual properties in either artists or scientists. Instead, it is more meaningful to speak in more general terms of creative situations and creative processes.

If these points are clear, it can readily be seen that creative situations are just as common in everyday life as are the conditions which can lead to creative thinking. In short, when a problem arises for which there is no predetermined "correct" answer, or when a need exists which leads the individual to externalize himself, creative processes may be evoked. Under these circumstances any individual may engage in that kind of mental activity which combines realistic thinking and imagination and which we call "creative thought." The young man "fixing up" an old automobile, the amateur radio builder, the housewife planning to redecorate her home, the maiden who designs and makes her own clothes, the teacher outlining a program for the school year, the traveler striving to express in a letter the experiences of his trip, the lover rhapsodizing the charms of his sweetheart—the examples might be multiplied indefinitely. In all these situations, the individual may utilize the processes of preparation, incubation, illumination, and verification in ways potentially as intricate as those of the artist. He may but does not necessarily do so. Perhaps there are two principal factors which determine whether or not creative thinking will occur. The first condition has already been suggested, namely whether or not the individual has had the requisite training in expression to equip him with the techniques and materials to be employed. That is the amateur radio builder must know something about electrical equipment and engineering; the girl must know how to use patterns and a sewing machine, etc.

The second factor has to do with spontaneity. It will be examined briefly in the following section.*

CONFORMITY AND SPONTANEITY

In order for creative thought to occur, it is essential that the individual be able to manipulate his perceptions and past experiences and to recog-

* A third essential condition—interest or motivation—is taken for granted.

expression rather than free and spontaneous ones. Yet this need not be the case. Schaefer Simmern (41) has shown how spontaneity of expression in painting can be gradually increased by teaching the individual to release his creative powers. Moreno's spontaneity training further exemplifies the same principle (28-30).

This problem of conformity and spontaneity has an importance over and beyond the self-expression of the individual as an individual. It also has a very great significance for the future of society. Fromm, for example, has pointed out the mechanism of "automaton conformity" as a hidden risk in democratic society. "The individual ceases to be himself, he adopts entirely the kind of personality offered to him by cultural patterns, and he therefore becomes exactly as all others are and as they expect him to be" (13, p. 185). The danger in this pattern is that the individual loses—or never acquires—the ability to think for himself, to reorganize his past experience in relation to present problems. His thinking becomes a matter of dealing with situations exactly as he has dealt with them before, or of seeking the solution in what others tell him, or of withdrawing from situations. Yet the grave problems of the modern world demand creative thinking on the part of leaders and followers alike, creative processes are needed to develop new and fruitful and satisfying social products.

There are, then, two major aspects of creative thinking, which thus combines realistic and autistic thinking. On the one hand, the creative thinker utilizes techniques of expression to solve a problem or satisfy a need, eventually achieving some tangible product by forming some medium—paint, stone, sounds, words, symbols, etc. On the other hand, the creative thinker utilizes his past experience, his present emotions and impulses, his perceptual reactions, in a free way to achieve some reorganization or new or individualized product. Spontaneity, a condition or group of conditions permitting the free manipulation of experience, is necessary for creative thinking, conformity, a condition or group of conditions interfering with or preventing the relatively free play of mental activities, works against effective creative thinking.

CRITICISM

Before leaving the subject of creative thinking, we must discuss one further aspect of it. The creative situation does not really terminate with the attainment of a tangible product, because, having permanence, it evokes a response in the audience for whom it was developed. Here, incidentally, is an important variable of the realistic pole of creative activity, the artist, the inventor, the mathematician, even the amateur radio builder, is, to a greater or lesser degree, creating, not for himself alone,

what factors are conducive to spontaneity. However, it may be postulated that some of these conditions can be sought in the emotional and personality structure of the individual, others in the conditions under which the individual is currently living, and still others in the nature of the learning conditions to which he has been exposed. A few comments can be offered on each of these points.

Conformity, rather than spontaneity, might be expected when the individual is highly dependent on others for emotional security, reassurance, and guidance. It might also be expected in individuals who, for whatever reason, have learned to repress unduly their emotions, feelings, and impulses. Thus in personality development, at least two kinds of condition might work against spontaneity, that which results in insecurity, dependency, and lack of self-reliance, and that which leads to overcontrol of emotion.

With respect to environmental conditions, conformity may be brought about as a result of strong pressures from without to avoid the free expression of impulses. Such pressures may be part of the work atmosphere, of the accepted pattern of interpersonal relations, or of more tangible restrictions in the form of custom, law, authority, etc. Another set of conditions may reside in the traditions of the social group, such as premiums on conventional behavior rather than on individuality. Other conditions may be a function of lack of opportunity for the development of self-expression, including little or no leisure time, little or no stimulus to artistic or intellectual activity, etc.

Although the conditions just mentioned are aspects of the learning process, there are others linked directly with how and what the individual learns. Here we mean to emphasize the tutorial situation, *per se*. Thus where education stresses the accumulation of information and specific skills, conformity is probably encouraged, with a consequent reduction in spontaneity. There can be no doubt that a serious problem of modern education rests in this very point. The successful student is all too often the one who loses his own independence of thought by sticking closely to textbooks and to the ideas advanced by the instructor, thus learning to apply mechanical techniques to ready-made problems. The familiar teaching methods can easily lead to this result.

Although we have treated the matter in a very general way, it can be approached more concretely. For instance, the fact that most persons seldom engage in artistic creativity may be accounted for partly by the manner in which art is frequently taught in the schools. Emphasis is often placed on proper forms, on proper techniques, etc., rather than on externalizing one's own emotions, perceptions, ideas. As in intellectual pursuits, therefore, the student acquires habitual and restricted modes of

poor understanding of creative situations. Criticism, in reality, includes far more than a simple judgment or opinion, as reference to the two requirements given above will show. The person who appreciates rather than engages in active criticism is subject to similar requirements, but to a lesser degree. It may be suggested, therefore, that the more appreciation is a genuine continuation of the creative situation, the more it approximates the two requirements of criticism, knowledge of the field and knowledge of the specific object.

CONCLUSION

With this section on criticism and appreciation, we bring to a close our discussion of the two aspects of mental processes which have had so long a history in philosophy and psychology. We have examined various situations in which realistic thinking predominates, including the use of logic, concept formation, transfer of training, and problem solving. We have reviewed the phenomena of imagination, from play to autistic thinking. Although we have repeatedly emphasized that these two aspects of thinking are not sharply differentiated from each other, we have drawn them together explicitly in the present chapter, where we have found that creative thinking combines them in an intricate pattern.

In the chapters to follow, we shall discuss those aspects of thinking to be designated as "personalized" or "personalizing" factors in thinking. The final section will bring together psychological principles accounting for the development of the *mental context* in terms of which thinking in each individual goes on, and the systems of organization whereby the mental context determines the course of thinking.

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but also for others. He must expect, therefore, that his creation will have an effect on the audience, resulting in emotional and cognitive processes leading to favorable or unfavorable judgments.

This further extension of the creative situation has been called "criticism." It is exemplified in the work of the creator by the process of verification, previously discussed, and we may look therein for the principal factors of verification, or criticism, by others. The creator has a basis for his self-criticism in his knowledge of the field in which he is working and in his knowledge of the particular object which he is striving to create. By the same token, criticism by others is only a genuine extension of the creative situation when two requirements are met, (1) when the critic knows something about the general field of which the object is an exemplar and (2) when he has made the effort to familiarize himself adequately with the specific object under consideration (cf. more detailed discussions by Dewey, 9, Maier and Reninger, 26, and others).¹¹

Of course, these requirements are seldom adequately met in the average person but apply to his representative, so to speak, the professional critic. The latter undoubtedly has an important part to play in the creative situation by analyzing, interpreting, evaluating the creative product. These functions are fulfilled to the degree that the two requirements set forth above are met. Deficient criticism, for instance, may result from insufficient acquaintance with the particular work in question. Thus the history of the arts is filled with too hasty adverse or favorable judgments made upon the first appearance of new works. By the same token, the other requirement may be lacking, as when there has been insufficient time for a new movement in art or knowledge to be understood, to say nothing of occasions on which persons have acted as critics with little knowledge of the field in which they are acting.

However, the average person is not a professional critic and participates therefore in the creative situation somewhat differently from the critic. His role is that of *appreciation*, as suggested previously. It may range from a sheerly emotional reaction, induced without delay, to an elaborate pattern of analysis and interpretation similar to that of the professional critic.

In this latter connection, it is essential to distinguish criticism as here formulated from other connotations of the term. Sometimes criticism signifies unfavorable judgment, to many people any effort to analyze, interpret, and point out weaknesses as well as strengths is regarded with disfavor, on the grounds that analysis destroys the illusion created by the object. This conception of criticism is very limited and represents

¹¹ Most writers on criticism would add a further requirement namely, an interest in, or liking for or ability to appreciate objects in the special field criticized.

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and in more gradual, subtle learning processes, which, as yet, are comparatively little understood. The effects of this latter kind of learning are becoming increasingly clear with intensive study of cultural differences, selective factors in perception and memory, and the evidence furnished by the clinic of the inner dynamics of personality.

In attempting to summarize the conditions which enter into the development of the mental context, it is necessary to recognize that learning, in accordance with our analysis of the field of attention, always involves an interplay between the organism and the environment [cf. Angyal (3), for an important explication of this relationship]. Since both organism and environment are extremely complex, the possibilities for their interaction are unlimited. It may be added that the combinations of conditions are always different for any two individuals. Beyond that, too, a further complication sets in when it is realized that, as learning progresses, there is a "self-organizing" property of the mental context which tends to preserve and increase individualized aspects of it. This point will be elaborated a little later.

A rough scheme of the conditions which influence the formation of the mental context has been provided by Kluckhohn and Mowrer (23), as can be seen in Table 7. The table gives a cross section, so to speak, of the conditions which are originally external to the individual, and obversely, gives a generalized cross section of the results of the internalization process. Certain conditions confront every individual, that is, are universal, in all cultures, other conditions are present only in a particular culture or in a particular group within a culture, whereas still others are "idiosyncratic," having an effect only on a few persons or a single individual. The net consequence is that an infinite variety of combinations is possible, so that each individual is characterized by a unique pattern. Even where the same general condition is postulated for a group of people, such as a set of family relationships or a mode of infant care, great variation occurs within that general framework in responding to and enforcing the condition.

We can conceive of the individual therefore, as undergoing a unique pattern of internalization, the conditions of which vary between idiosyncratic experiences and those shared by all men with, of course, every intermediate degree of generality. As development proceeds, all these factors interplay, the *biological* providing general bases for social experience, the *cultural* determining how biological characteristics will be expressed, the *social* emphasizing certain features of the physical environment, and so on in an intricate fashion. It is impossible, therefore, to separate the components of the mental context, except for purposes of convenience in discussion. We must always speak in terms of re-

Chapter 13. THE INTERNALIZATION OF EXPERIENCE

It is our purpose in this and the following chapters to outline the nature of the "mental context" in terms of which thinking goes on in any individual. By this name, we mean the organized and ongoing system composed of the effects of past experience and of current processes in the organism, in the midst of which, so to speak, any present thought process occurs.¹ The mental context is the complex of controlling and regulative systems established during the course of learning. Thus current thinking in the individual can only be fully understood by relating it to the background of learning and to the mechanisms by which that background influences later response.²

We have already set the stage for a discussion of the mental context in Chapter 3, where we outlined the nature of the field of attention. We were concerned there to show the factors which enter into the current course of thinking, without explicitly developing the role of past experience. It is now time, however, to explain more fully how it comes about that past experience influences thought processes in the present. Thereafter, we shall discuss the result of past experience in the formation of more or less permanent regulating systems, which link together the inner and outer components of the field of attention.

GENERAL MEANING OF INTERNALIZATION

Various titles have been suggested for the fact that the individual incorporates in his own system characteristics originally external to himself, such as symbolic representations of environmental objects (cf. the discussion of concepts in Chapter 7) the norms of his culture, and the real or ideal traits of persons with whom he has close emotional ties. We shall call this progressive absorption process the 'internalization of experience'.³ It has its basis both in the specific recognizable learning processes which are studied extensively in the psychological laboratory

¹ It should be remembered that this organized system is not static but is in a state of continual imbalance and dynamic reorganization since the parts of the system are in relationship to each other.

² Cf. the discussion of context by Ogden and Richards (32).

³ Sherif calls it interiorization (37).

by failing to take adequately into account the deep-lying characteristics of early learning, actually assumed that the results of learning were pre-determined by the biological nature of man. The chief reasons for the vast change in viewpoint in the social sciences in the past fifty years lie in the study by anthropologists of cultural differences, in the modern investigation of child development, and in the intensive research by psychologists on the nature and functions of learning. Building upon these bases, sociologists are increasingly uncovering the effects of roles and relationships in groups (cf. Newcomb's treatment, 31).

It is not necessary to belabor the point. The starting points of behavior in the infant owe their specific direction and outcome to the internalization process. But the developing organism is not passive, either, not simply a recipient of environmental pressures. It acts upon the environment, is stimulated by, and reacts to, stimuli, and, as time goes on, along with increased organization of behavior, participation becomes greater, as selective and regulative systems are established and strengthened. Thus later experience is dependent upon previous experience. As development proceeds, behavior tends to become more and more organized, with the result that the effect of later experience depends more and more upon the effects of earlier experience.

We may say, then, that the starting points of behavior lie in the need system of the infant,⁴ together with very generalized characteristics of the infant's particular organic system. Thus the infant requires food, affection, fairly constant temperature, sleep, etc. However, the conditions which will satisfy those needs, and the circumstances attendant upon their satisfaction, are not at all fixed. Indeed, the conditions vary according to the general outline given above, *i.e.*, the pattern characteristic of the infant's role, the groups of which he will become a member, his culture, and the idiosyncratic events which apply to him alone. Within this framework, the general directions of the individual's behavior and the bases for further modification are established. One aspect of development therefore is the elaboration of the motive system. The original needs and impulses of the infant form starting points upon which learning acts to form the complex pattern of striving and impulse satisfaction of later stages in development.

In addition to the elaboration of the motive system, other trends also have their origins in the original biological characteristics of the organism, namely, the particular ways in which activity is carried out. For want of a better term, these trends may be called "traits." They represent

⁴ More precisely, in the fetus. For the sake of simplicity, we shall assume the preparatory development of the prenatal period, *i.e.*, the need system in this rudimentary sense, exists at birth.

TABLE 7 CONDITIONS ENTERING INTO THE DEVELOPMENT OF THE MENTAL CONTEXT*

General determinants or classes of conditions which influence development	Degree of universality, or general components of the mental context			
	Universal	Communal	Role	Idiosyncratic
Biological	Birth death, hunger, thirst, elimination, etc	"Racial" traits, nutrition, endemic diseases, etc	Age, sex, caste	Peculiarities of stature, physiognomy, glandular make up, etc
Physical environmental	Gravity, temperature, time, etc	Climate, topography, natural resources, etc	Differential access to natural resources, etc	Unique events, accidents, etc
Social	Infant care, group life, etc	Size, density, and distribution of population, etc	Cliques, "marginal men," etc.	Social "accidents," such as death of a parent, meeting particular people, etc
Cultural	Symbolism, taboo on incest and in group murder, etc	Traditions, rules of conduct, manners, skills, knowledge, etc	Culturally differentiated roles	Folklore, individually transmitted, etc

* Slightly modified from Kluckhohn and Mowrer (23)

relationships between the person and the external world in which he develops and functions

BEGINNINGS OF EXPERIENCE

We shall not attempt to describe in full detail the course of learning but rather to point out some of its significant features, to the end of providing a basis for understanding the mental context.

The first point of major importance has to do with a fact of immense significance in the social sciences, namely, that the human infant is born in a relatively unformed and helpless state. Hence development has, so to speak, barely begun at birth, rather than being nearly completed, as is generally the case in lower organisms. The result is that we can know very little about the process and results of internalization by referring them to the biological nature of man but rather must search in the learning and development of the individual and in the external conditions attendant thereon. To be sure, the problem has not always been approached in this manner. The old instinct theories of human behavior,

of the resulting organization around such constructs as motive systems, traits, attitudes, and concepts. Now let us briefly consider more explicitly the learning conditions which are responsible for the internalizing of experience and hence lead to organization.

To begin, it is necessary to clarify two general problems in the total internalization process. The first of these has to do with the fact that two kinds of learning go on in the course of development, namely, (1) that which depends upon an individual relation to the physical environment and (2) that which depends upon a relationship to one or more other persons. Learning of the first kind may be called "individual acquisition." Under that heading can be included learning which results from the explorations and manipulations of the child and from the mere repetition of stimuli. Later on, this process of individual acquisition becomes increasingly deliberate, *i.e.*, under the voluntary control of the individual, although habit systems derived from individual acquisition, as well as from other kinds of learning, may be quite nonvoluntary or mechanical. The learning of the second kind, which involves other people, may be called "social learning." Its basis, as we have intimated, is to be found in the prolonged state of plasticity of the human infant, during which time, perforce, at least one other person is present in the environment. Through the mediation of this person (usually the mother), as well as of others, the child learns to adapt to society and to behave in the ways prescribed by his culture.

Needless to say, neither of these kinds of learning is independent of the other. Rather, they are simply contrasting aspects of the total process of interaction between organism and environment. Neither is a one way affair, for the child influences and acts upon his environment, as well as receiving impressions from it.

The second general problem of internalization concerns *immediate vs. long term* effects. Although we shall presently discuss conditioning as the specific mechanism by which learning occurs, at least in the beginning, accounting for the permanent effects of learning has been a puzzling problem. Since conditioning is specific and subject to extinction, psychologists have suggested various additional factors to explain more lasting and generalized effects of learning, for example, canalization (Murphy), trauma (G. W. Allport), fixation (Freud), sentiment (McDougall), and reinforcement (Hull). Whatever the term employed, the fact remains that permanent effects of learning must somehow be accounted for. Hence it will be necessary to give proper recognition to this point in the discussion to follow.

With these two problems in mind, we are now in a position to explain how experience is internalized. Four factors appear to be mainly

in later behavior characteristics of the organism determining *how* a response is made—quickly or slowly, forcefully or weakly, positively or negatively, vocally or silently, accompanied by emotion of a certain kind or of a different kind, etc. Such trends become not only more definite but also more complicated as learning proceeds and they become organized in relation to particular classes of stimuli, particular symbolic mechanisms, particular patterns of emotional control and expression, etc. Hence the simple trends suggested by words like “quickly,” “forcefully,” “positively,” and the like, come to require far more precise definition, so that the ways in which responses occur now acquire names like “persistently,” “extrovertedly,” “dominantly,” “cheerfully,” “absent-mindedly,” and so on, the specificity of the term and the complexity of the characteristic it is intended to signify depend on how many persons it has reference to—again in accordance with the scheme presented in Table 7.

Getting back now to our present concern, we may follow Murphy (28) in hypothesizing that traits have their starting points in the biological structure of the infant, *i.e.*, in sensory-affective relationships, in qualities of the various tissue systems (for example, the character and quantitative relationships of the endocrine system), as well as in more complex conditions, such as interrelationships among the tissue systems. The process of internalization involves the shaping of these organic starting points into the ways of behaving which have been called “traits.”

In addition to motives and traits, as fundamental directions in the organization of experience, we should mention the formation of *attitudes* and *concepts*, although we have already discussed the latter and intend, in Chapter 15, to discuss the former in some detail. At this point, we are more interested in outlining the characteristics of internalization rather than in specifying its results. However, it is pertinent, for the sake of completeness, to point out that, during the internalization process, there are established specific systems through which motives and traits are linked with specific stimuli and responses. That is, in keeping with our previous formulation, stimuli, either from the external pole or from the internal pole, intrude upon a system already organized to some degree, at least, in specific, as well as general, ways and hence can only bring about effects in keeping with that organization.

HOW EXPERIENCE IS INTERNALIZED

We have said that internalization is a function of dynamic interaction between the organism and the physical social-cultural environment, with the result that the biological starting points become shaped, modified, and directed by learning. For convenience, we have oriented our discussion

other learning mechanisms, notably symbolic functions, can take over. In this case, the further elaboration of behavior may represent the conditioning of previous conditioned responses, that is, conditioned stimuli may function in the way in which the original natural stimuli functioned.

b The earliest conditioning may sensitize the organism, making it easier for certain kinds of connections, rather than others, to be established in later stages of development. That is, directions are laid down in such a way that stimuli are more and more likely to have particular consequences. Reinforcement may then be a function either of simple repetition or of more indirect conditions, that is, at some point along generalization gradients rather than at the central point. For example, conditioned responses to the mother need not always be reinforced in exactly the same way to be strengthened and rendered more permanent.

c. It should also be recognized that conditioning has other general characteristics than the sensitization discussed above. Conditioned responses do not remain separate from each other in some additive fashion but become interrelated, in accordance with the principles we have already stated with reference to the transfer of training (see Chapter 8). For example, the mother is the focal point for numerous perceptions, on the basis of which she acquires generalized properties, similarly, hunger gradually becomes associated with many different foods rather than with just one. Furthermore, any given stimulus pattern is likely to be complex rather than simple, an object has many properties and what appears to be a unitary event or experience may actually have an effect through several sensory modalities. Here again are considerations which allow for overlapping reinforcements (an apple is not only a taste, but it is also round, as are bottles, balls, and oranges) and for evoking responses without the complete original stimulus (cf. reintegration, discussed in Chapter 4). Hence conditioning can be seen to form the basis of the development of concepts and attitudes.

In short, the internalization process originates in the earliest conditioning of the infant, by means of which the initial direction and elaboration of behavior occur through the linkage of stimuli and responses.

2 *The Trial-and-error Character of Learning* In addition to the relatively specific and mechanical characteristics of conditioning, in which the infant is acted upon by combinations of environmental conditions, learning has variable characteristics. Furthermore, the infant soon begins to participate actively in his contacts with the environment. By the term "trial and error," therefore, we mean to stress the importance of exploration, manipulation, effort to carry out a series of responses, or other processes which bring the child, by his own actions, into contact with the environment in a variable manner. Of course, this variable ac-

responsible, namely, (1) the conditioned-response character of learning, (2) the trial and error character of learning, (3) the self-organizing character of learning and conditions which promote permanence, and (4) the symbolic character of learning

1 The Conditioned Response Character of Learning The basic modification and elaboration of the individual come about as a result of conditioning, *i.e.*, the establishment of new relationships between stimuli and responses.⁵ According to this principle, when two stimuli occur in close temporal proximity and one of them naturally evokes a response, the other may also come to evoke that response.⁶ But, in addition to the requirement of contiguity, it is usually necessary for the two stimuli to occur together repeatedly, until such a time as the association is strong enough for the new, or conditioned stimulus to evoke a response without the natural, or unconditioned, stimulus. At later stages, further reinforcement may be necessary to reestablish and strengthen the connection. Still a third essential condition is that some function be served by the establishment of the conditioned response, *e.g.*, need reduction.

All three of these requirements (contiguity of stimuli, repetition, and need reduction) are preeminently present in the life of the infant. Simple sequences of events recur over and over, involving very much the same patterns of stimuli and responses and bearing a relation to the satisfaction of the infant's needs. In this way, the first modifications of behavior occur in a manner which can meaningfully be understood in essentially mechanistic terms, allowing adequately for variations in the external conditions for individual differences in sensitivity and response, and for gradients of stimulus and response equivalence.

In order to extend the conditioning principle into later stages of development it is necessary to suppose that hierarchies of conditioning are possible, *i.e.*, that early conditioning is somehow permanent enough to serve as a basis for later conditioning. It could do so in the following ways:

a Because of the combination of extreme plasticity and continual reinforcement, the earliest conditioned responses may be so deeply established that they become permanent. This early, deep, permanent conditioning may continue up to some period in development in which

⁵The word *new* here signifies relationships which are not necessarily inherent in the biological constitution of the organism. It is quite possible that many stimulus-response relationships which are seemingly inherent are really established by conditioning. For instance the linkage between emptiness of the stomach and food although essential for survival may itself be a function of conditioning.

⁶The equivalence of stimuli and responses actually makes the situation more complex and provides a basis for greater flexibility in learning by conditioning than the simple statement given might suggest (see Chap. 8).

often used to illustrate these relationships is that of a field of forces, in which each place has either an indirect or a direct relation to each other place. A change or disturbance in one place has an effect which depends upon all these relationships. It may result in a shifting about, a realignment of forces, continuing until some stable organization is achieved.

We may conceive of selective and regulative systems in a similar fashion, except that the field of forces is so complex and disturbances are so frequent that it is unlikely that a stable organization ever exists. In any case, the analogy may help to emphasize this second meaning of self-organization in behavior. Within the individual, the subsystems are interrelated and communicate with one another, so to speak. A disturbance at one place will have an effect which depends upon many interrelationships. A "disturbance" here means some activity within the system, no matter how aroused—a nervous impulse aroused by an external stimulus, the breaking down of barriers among subsystems, the building up of tension beyond the threshold amount, or however it might be defined. If we were to apply this principle on a strictly psychological level, we might say that motives, for example, are not distinct and separate from each other. The desire to meet a pretty girl is accompanied, usually, by the desire to avoid humiliation by making a socially acceptable approach. Concepts, as we have seen in Chapter 7, are not discrete entities either. A dog is also a big or little dog, and it is also an animal, and it may be a pet or a vicious creature, etc. Similar considerations apply to traits and attitudes.

Hence the internalization of experience has permanent results but is also self-organizing. On the one hand, new experience enters an already existing system and depends on it for its effect. On the other hand, the subsystems within the total system influence and modify each other.

As a final point, it is important to note that variation in behavior is still possible all along the developmental sequence. Organization is never complete and stable, and the relationships within the system vary widely in strength. Thus change and variability in behavior are possible, more in some ways than in others, more in some people than in others.

4 *The Symbolic Character of Learning* The development of language vastly complicates the internalization process.¹ As time goes on, any object or act comes to have an internal, symbolic counterpart which can be employed in lieu of the external object or act. Thus the possibilities for additional learning are nearly unlimited, because (a) experience can be communicated effectively and quickly from one person to another, (b) experience can be short-cut by dealing with symbols rather

¹ We confine ourselves here to the symbolic function of language without intending to say that it is the only symbolic function.

tivity is not by any means purely accidental but occurs in terms of such organization (motives, traits, concepts, attitudes) as has already developed. The seemingly paradoxical situation that the person is molded by the particular characteristics of his environment (hence made like others of his culture and group) and yet becomes increasingly individualized is furthered by the trial-and-error character of learning. The consequences of exploring and manipulation depend upon what there is to explore and manipulate, upon the codes which govern the child's activities, and upon the rewards which accrue from them. At the same time, the child's own tissue system determines to a large degree how active he is in exploring, how rapidly he develops, how strongly he reacts emotionally, etc. Beyond this, as organization progresses further, the child behaves, to an ever-increasing degree, in terms of his own organization. Thus, at one and the same time, learning makes the individual more and more what is permitted and required by his environment and yet more and more like himself.

3 The Permanence and Self-organizing Character of Learning The preceding discussion has paved the way for this point. We have shown how permanent effects of early learning can be accounted for in the first, basic conditioning of the infant. This forms the substratum for later learning, the permanent effects of which may be sought in the reinforcement of earlier trends, in emotional reinforcement, and in symbolic structures. Gradually, selective and regulative systems (motives, traits, attitudes, concepts) are established and behavior becomes more organized. Since the formation of selective and regulative systems is so much a function of the internalization of experience, it is evident that, by means of them, previous experience influences present behavior. The strength and character, e.g., the types of relationships involved, the consistency or inconsistency, etc., of previous experience determine the strength and character of the selective and regulative systems, as well as, more obviously, their particular content.

Internalization thus has permanent results in the establishment of the systems which we have mentioned. These have a self-organizing effect on behavior. That is to say, later activities of the individual depend to a greater or lesser degree upon the results of previous experience—stimuli impinge upon already partially organized systems, and responses emerge from those systems.

The notion of a self-organizing property in learning has another meaning also, for the systems of which we have spoken are not independent of each other. They are really subsystems, making up the individual as a whole. Within this more inclusive system, they have active relationships to one another, close or remote as the case may be. The analogy

will have and what they are supposed to achieve. Several examples of detailed studies will serve to illustrate the point.

The role of particular affectional relationships is well illustrated by case histories of individual personalities. In them the role of parent-child relationships in social learning is often vividly brought out. The case of Harry, reported by Bettelheim (4), is a particularly good illustration. Harry was a 7-year-old delinquent boy whose maladjustment stemmed from disturbances in the central affectional relationships that we have been speaking about. His gradual rehabilitation was directly related to the establishment of satisfying and constructive substitutes for the unsatisfactory and profoundly disturbing parents.

At the risk of oversimplifying the picture, we may note several points about this case. Harry's parents were unable to offer the kind of affectional relationship which constitutes an essential condition for the internalization process. The mother was punitive and severe with Harry, restricting his activities in many ways and actually rejecting him in favor of his sisters. At the same time, she encouraged his manifestations of daring and his ideas of his own excessive power. The father, who at first submitted to the domineering of his wife, later turned to alcohol. During states of intoxication, he boasted of his strength, engaged in violent behavior, and abused his wife and children. He was however, submissive and remorseful when sober. Thus Harry was unable to please his parents or obtain gratification from them. They treated him with extreme inconsistency and created in the home an atmosphere of discord, violence, and hatred. He was rejected by his mother and had as an object of identification a father whom he feared and hated as well as loved, and who, in any case, was certainly not a good model upon which to base one's own behavior.

Harry's symptoms, growing out of this general situation, were truancy, stealing, begging, and other deviant behavior, together with self-destructive and aggressive tendencies. Underlying this behavior were deep conflicts and intense insecurity. He was unable to maintain normal, acceptant interpersonal relationships with others and could not, or did not know how to, control his impulses.

The treatment of Harry, in the special school to which he was referred, centered around four points. (1) The effort was made to establish for him a stable, secure, and comprehensible environment, free from violence and coercion, in which he was accepted by others, an important aspect of this phase of treatment was showing him that gratifying give-and-take interpersonal relationships are possible. (2) He was assisted in the building of a different picture of himself, one in which he could substitute his normal role as a small boy for the tough, grandiose, self-sufficient,

than with physical objects and overt acts, and (c) previous learning can be utilized in elaborate ways by manipulating symbols instead of the original acts and perceptions. At least in its earliest stages, the learning of symbolic responses can be explained as simple conditioning by the repeated linkage of words and objects. In due course of time, the word substitutes for the object and, eventually, words can themselves act as reinforcements and further learning can be built upon them. Hence, as Murphy points out (28), once language develops, the conditioning process need no longer involve laborious sequences of stimuli and physical responses but can be cut across or abbreviated by means of verbal responses. Furthermore, symbolic responses make it possible to bring large segments of past experience into a present act, as shown, for example, in the intensional aspect, or connotations, of concepts. When these conditions exist, internalization can proceed to well nigh unlimited degrees.

CULTURE AND FAMILY

The internalization of experience, occurring under the conditions of learning which we have just defined, has most significance for us with regard to social learning, that which depends primarily on relations with other persons. As a result of it, the individual develops the selective and regulative systems which make him act, think, and feel in general ways characteristic of his group and culture.

Social learning molds the child in two ways. On the one hand, it is the means whereby the general pattern of the group and cultural norms, codes, disciplines and practices are instilled. This is what Kardiner would call the development of the basic personality structure (20). But since, perforce, social learning involves *particular* persons, the child is subject to that interpretation and enforcement of the cultural norms made by those responsible for his training. Beyond this, the particular emotional relationships in social learning have vastly important implications for personality development and in turn, for the mental context. Thus those who have a direct influence on the child (in our society, the parents), have a double function of conveying and enforcing the requirements of group membership and of managing the dependent affectional situation in such a way as to equip the individual for future interpersonal relationships. Modern studies of social learning recognize keenly the significance of these functions (cf. 6, 11, 13, 17, 20, 21, 26, 28, 40, etc.). Thus it becomes essential to understand that at the center of the internalization process is a particular pattern of affectional relationships. These considerations make it necessary to give brief attention to the family, as the primary situation in which affectional relationships occur, and to the culture, as specifying in a general way what form these relationships

TABLE 8 SOME CHANGES IN SUCCESSIVE GENERATIONS OF THE SOUTHERN ITALIAN PEASANT FAMILY ACCOMPANYING REMOVAL TO A DIFFERENT CULTURAL ENVIRONMENT*

<i>Southern Italian Peasant Family in Italy</i>	<i>First generation Southern Italian Family in America</i>	<i>Second generation Southern Italian Family in America</i>
A General characteristics		
1 Patriarchal	Fictitiously patriarchal	Tends to be democratic
3 Well integrated	Disorganized and in conflict	Variable depending on the particular family situation
5 Active community life	Inactive in American community but somewhat active in Italian neighborhood	Inactive in Italian neighborhood but increasingly active in American community
6 Emphasis on the sacred	Emphasis on the sacred weakened	Emphasis on the secular
8 Strong family and community culture	Family culture in conflict	Weakened family culture, reflecting vague American situation
9 Sharing of common goals	No sharing of common goals	No sharing of common goals
13 Culture transmitted only by the family	Italian culture transmitted only by family but American culture transmitted by American institutions other than the family	American culture transmitted by the family and by other American institutions
B Size		
2 Many children (10 not unusual)	Fair number of children (10 unusual)	Few children (10 rare)
C Roles and statuses		
1 Father has highest status	Father loses high status or it is fictitiously maintained	Father shares high status with mother and children slight patriarchal survival
3 Mother center of domestic life only and must not work for wages	Mother center of domestic life but may work for wages and belong to some clubs	Mother acknowledges domestic duties but reserves time for much social life and may work for wages
4 Father can punish children severely	Father has learned that American law forbids this	Father has learned it is poor psychology to do so
9 Son expected to work hard and contribute to family income	Son expected to work hard and contribute to family income but this is seldom realized goal	Son expected to do well in school and need not contribute to family income
D Interpersonal relations		
1 Husband and wife must not show affection in the family or in public	Husband and wife not demonstrative in public or in the family but tolerate it in their married children	Husband and wife may be demonstrative in the family and in public

* From Campisi (7) We retain the original headings and numbers of selected items in Campisi's Table 1

and violent conception he held originally (3) He had to be provided with a new and different mother figure, one who was dependable, was interested in him for his own sake, did not continually punish him, and provided what he needed and wanted (4) Finally, he had to acquire a new and different father figure, one who could serve as an understandable and consistent source of authority and one with whom he could identify as a model in the development of inner controls over his behavior

We need not trace the history of how these changes were achieved and thus led to the rehabilitation of this small boy It is sufficient for our purposes to point out the extraordinary clarity with which the case of Harry demonstrates the central importance of affectional relationships Harry literally could not learn as long as those relationships were disturbing and unsatisfactory—and this was true with respect not only to social learning but also to school subjects Once he had begun to develop satisfying affectional relationships with acceptable parental substitutes, the internalization process also proceeded satisfactorily, *i e*, he began to develop socially adequate selective and regulative systems

In addition to providing case-history material, many studies have revealed the role of the family in molding the individual For example, Schaffner (35) has analyzed the relationship between the authoritarian German family and general factors in the behavior and thinking of German society Thus the fact that the German father is the dominant, absolute figure in the family, the model and ideal to be followed by the children, has a profound effect, one aspect of which is that there was created a picture of human relationships into which Hitler readily fitted The virtues enforced by German culture, such as discipline, fear of authority, orderliness, manliness, and militarism, all prepare the individual for the kind of thinking and acting required in an authoritarian society and also render adjustment to a different, *e g*, democratic society extremely difficult*

An example of changes in the family with resulting effects on the internalization process is a study by Campisi (7) of three generations of the southern Italian family A few of his observations are presented in Table 8

It is apparent that moving from one country to another has brought about many important changes in the central relationships of the Italian family For instance, the family tends to become more democratic, the mother coming to share status and authority with the father, and the children coming to be treated equally Other important changes occur

* Schaffner's study is but one of many efforts to relate German thinking and acting to the conditions of internalization in German society [cf Fromm (13), especially]

The socially defined dangers of slum life originate in the threat of disapproval, ridicule, or rejection of the individual by his family, play group, gang, church, club, and so on. All these lower-class groups make cultural demands of the child and adolescent, just as do the middle-class family, play group, and so on. But the demands are generally different than those of the middle class group. In other words, the lower-class individual is taught by his culture to be anxious about different social dangers. Whereas the middle-class child learns a socially adaptive fear of receiving poor grades in school, of being aggressive toward the teacher, of fighting, of cursing, and of having early sex relations, the slum child learns to fear quite different social acts. His gang teaches him to fear being taken in by the teacher, of being a softie with her. To study homework seriously is literally a disgrace. Instead of boasting of good marks in school, one conceals them, if he ever receives any. The lower-class individual fears *not* to be thought a street fighter, it is a suspicious and dangerous social trait. He fears *not to curse*. If he cannot claim early sex relations, his virility is seriously questioned.

Thus society raises many anxieties in slum people also, but with regard to the attainment of what seem to middle-class people to be strange goals. For those who must live in a slum community, however, these goals are realistic and adaptive (pp. 29-30).

It is evident therefore that the internalization process, operating specifically at the level of the central affectional relationships in the family, nevertheless depends in a wider sense upon the subcultural environment.

Finally, it is necessary to extend our conception of internalization to the still wider level of the general culture. Among the investigations which best demonstrate the significance of cultural factors are the extremely informative ones made by Kardiner and others (20, 21). A special technique, "psychodynamic analysis," has been developed by Kardiner, by means of which the primary and secondary institutions in a culture are identified and their effects traced in the personality development of members of the society. The general results and trends common to a given culture because of common exposure to the same institutions are represented in the "basic personality structure."

The analyses of various cultures presented in the two books by Kardiner reveal strikingly the fundamental differences in internalization and resulting behavior which occur in different cultures. In connection with our present special emphasis, it is noteworthy that, in all Kardiner's analyses, the nature of the various patterns of central affectional relationships are of fundamental importance. Thus it is found that, in Marquesan culture, the mother is a frustrating object to the child. The relationship is characterized by neglect and a lack of tenderness and care. In consequence, the individual's longing for protection and love are not

TABLE 8 SOME CHANGES IN SUCCESSIVE GENERATIONS OF THE SOUTHERN ITALIAN PEASANT FAMILY, ACCOMPANYING REMOVAL TO A DIFFERENT CULTURAL ENVIRONMENT * (Continued)

<i>Southern Italian Peasant Family in Italy</i>	<i>First generation Southern Italian Family in America</i>	<i>Second generation Southern Italian Family in America</i>
D Interpersonal relations (Continued)		
3 Father consciously feared, respected and imitated	Father not consciously feared or imitated but is respected	Father not consciously feared but may be imitated and may be admired
4 Great love for mother	Great love for mother but much ambivalence from cultural tensions	Love for mother shared with father
F Birth and child care		
1 Many magical and superstitious beliefs in connection with pregnancy	Many survivals of old beliefs and superstitions	Few magical and superstitious notions in connection with pregnancy
4 Child is breast fed either by mother or wet nurse, weaning at about end of second or third year by camouflaging breasts	Child breast fed if possible, if not, it is bottle fed same practice with variations regarding weaning	Child bottle fed as soon as possible, breast feeding rare, no weaning problems
I Psychological aspects		
1 Fosters security in the individual	Fosters conflict in the individual	Fosters security with some conflict lags

in the enforcement of basic disciplines, such as those related to weaning. The modifications in the patterns of interpersonal relations, enforcement practices, etc., are not sudden, however, but occur over a period of time in which there is conflict and readjustment.

In a little book on studies conducted by him and his coworkers, Davis (8) has summarized a number of interesting differences among socioeconomic groups within our own society with respect to the internalization of experience. For example, a comparison of lower-class with middle-class families reveals that, in the former, more babies are breast-fed only, more babies are fed at will, the children are weaned later, sphincter training is begun later, and greater freedom is permitted in staying up late, going to the movies, etc. Davis states "It seems clear, therefore, that, as compared with the rearing of middle class children, the early training environment of most lower class children permits them fuller gratification of their organically based drives" (8, p. 18). The patterns of anxiety differ also at different socioeconomic levels. In the lower class, there are many worries about physical dangers such as cold, insufficient food, darkness, and eviction. Furthermore, the lower class has a different pattern of socially defined pressures from that which characterizes the middle class. It is worth quoting Davis at some length in this connection

by means of which the group and cultural norms and practices are brought to bear upon the individual. It now becomes necessary to seek the specific processes which operate in social learning. A number of such processes may tentatively be distinguished.

"Identification" is the name given to the situation in which the child models himself after the persons, especially the parents, with whom he has strong emotional attachment. The process of incorporating characteristics of others with whom the child is identified may be called "introjection."¹⁰ It is a very subtle and continuous relationship and process, indeed, both sides of the relationship are usually only vaguely aware, if at all, of what is going on. One consequence of this is that the child absorbs, not only the teaching which the parents are deliberately trying to instill, but also other things. In any event, it is evident that the identification relationship is fundamental in the internalization of experience, since upon it depends the acceptance by the child of the parents' behavior and their interpretation of the cultural norms.

The influence of other people in social learning involves three kinds of interpersonal relationship, namely, *imitation*, *suggestion*, and *sympathy*. All three of them have been the subject of much controversy. The two extremes are represented by the view, on the one hand, that one or more of these kinds of relationship are basic instincts or biological characteristics of the organism (24, 41, 43) and, on the other, that they are merely descriptive terms for more significant, deeper processes (1, 10, 22, 38). In general, it is probable that they can best be explained in terms of conditioning theory (5, 19, 25, 28, 29, 45). But, as will appear below, whatever the specific mechanism, these three familiar kinds of social relationship, once the preliminary conditions are established, represent significant aspects of social learning.

Imitation In imitation, an individual carries out action "which copies, more or less exactly, the action of another" (9). Two principal kinds of imitation have been described, together with a number of transitional forms. (1) "Echo," or conditioned-response imitation (2, 29), occurs merely through the repetition of sequences of stimuli and responses. The conditioned stimulus, in this case, is the same as the response which it

¹⁰ This distinction is not universally made, but it appears to be a useful and meaningful one. We limit introjection here to this function in the identification situation. Fenichel makes a much wider use of the term but also implies the present meaning (11, p. 148). Symonds, who gives a detailed account of both identification and introjection, appears to agree closely with the present view (39, Chaps. XII and XIV). It should be noted, incidentally, that introjection is not the only mechanism which operates in the identification relationship. For example, there may be projection, displacement, and various expressions of, and reactions to, approval, disapproval, aggression, etc.

ified, and many anxieties in the adult stem from this condition, most directly evinced in direct or disguised hostility toward women. In contrast, the real protectors of the child are the secondary husband (polyandry is practiced among the Marquesins) and the father. An outcome of this relationship is a strong and friendly tie to, and among, men. However, the child is not subjected to restricting or unreasonable demands or disciplines, and hence there are great freedom and spontaneity in relations between children and adults, and children are typically independent and self-confident. In Alor, the relationships with both parents are inconsistent and confused or actually marked by neglect or rejection. This condition is at least partly responsible for the mutual hostility, distrust, and suspicion which characterizes the Alorrese basic personality. At the same time, the many tensions in childhood appear to stifle the development of organized, consistent modes of acting, so that, despite considerable aggression, there is no effective means to release it. Still another pattern was found among the Comanche. Here, maternal care was good, *i.e.*, consistent and helpful, and the relationship to the father was also warm and comprehensible. These conditions contributed to a fairly simple, self-confident personality and to strong cooperative relations within the society.

It is impossible to give in so brief a space an adequate account of these conditions, especially is this the case when extractions are made from the total cultural complex for it is repeatedly evident in Kardiner's analyses that the fundamental institutions are interdependent. However, the illustrations presented above, even though much oversimplified, serve to emphasize the point we are concerned with. The culture sets the general framework within which internalization occurs and specifies the general character of the central affectional relationships. Where cultures differ—and the parental and interpersonal relationships are basic features of culture—internalization differs and behavior differs.*

PROCESSES OF SOCIAL LEARNING

We have defined the internalization process so far in terms of some general characteristics of learning and of central affectional relationships.

* The general position adopted in the preceding sections appears to be in accordance with that outlined by Orlansky in his masterly review of the literature on child care (33). The conclusion reached by Orlansky is that personality formation does not depend so much upon specific influences such as particular weaning practices, particular modes of sphincter training, greater or lesser degrees of physical restraint, etc., as upon the entire pattern of constitutional, cultural, interpersonal, socioeconomic, etc., factors. Hence personality formation cannot be attributed solely to any particular condition or to one particular period of development; rather, it is the long continuing influence of a complex of conditions which should be stressed.

traced to conditioning, as has been stated. Two principal conditions, both derived from earlier learning, exist to make it possible for an individual to influence the child extensively by suggestion: (1) words and gestures become conditioned stimuli to evoke responses, and (2) the child typically has rapport of a sort which makes him willing to accept the suggestion. Both these conditions exist very early, of course, in the life of the child and represent merely aspects of the total pattern of preparatory learning. The second condition depends upon the central emotional relationships that we have mentioned before. Previous conditioning therefore equips the child to respond to suggestions by linking words and gestures to acts through specific reinforcements and to do what someone else wishes him to do.¹² Once these preliminary requirements have been attained, then, suggestion becomes a very effective guiding mechanism in the child's relations to others.

Sympathy. This third kind of relationship in social learning means "shared feeling or emotion" (9). Once again, the conditioning process is basic in equipping the child to respond sympathetically to others. In the first place, the behavior of others, particularly emotional behavior, must acquire cue value, that is, become conditioned stimuli for evoking response. In the second place, the child must learn, in a more general way, to be aware of, and to respond to, other people. These two conditions, again, exist as widespread, continual aspects of the environment in which the child lives and thus for most children can readily lead to sympathetic response. But they can also lead to unsympathetic response (30), in which the response to others is still positive but contrary to the emotion expressed by the other person. We should have to search in the particular characteristics of previous conditioning for the factors which are responsible, in any given case, for these contrasting kinds of response. The same consideration applies, it should be noted, to imitation and suggestion.

The most detailed study of sympathy now available, that carried out by L. B. Murphy (30), included several ingenious experiments, in addition to observation in the natural nursery-school environment. Murphy emphasizes the role of learning and shows that quite individual patterns of sympathetic response emerge from the child's social experience. Five principal forms of sympathy were observed, namely, (1) cooperative, practical sympathy, in which children respond spontaneously to the needs of their playmates, (2) masked aggression, which a child may use to avoid disapproval, (3) projected anxiety, by which a child attributes his own anxieties to others, (4) emotional identification, which occurs primarily

¹² The central emotional relationship is not necessarily of just one particular kind, i.e., it may be love, or fear, or something else (29, pp. 237ff.)

evokes and may be an individual's own act or that of another. Furthermore, it may be an "accidental" occurrence, or it may be deliberately reinforced, *e g.*, by the parents. There is no reason to postulate any special mechanism for the earliest kind of situation in which the child behaves as others behave, because it may be a simple conditioning situation.

(2) "Copying" is the second major form of imitation and represents the situation in which an individual makes his behavior "approximate that of a model and [knows], when he has done so, that his is an acceptable reproduction of the model act" (25, *cf.* also 2, 10, 24, 29). In this later form of imitation, preliminary learning is necessary to equip the individual with the ability to perform the acts required, and it is also necessary that something be gained from acting the way another does (not necessarily something tangible—the reward may be parental or social approval). Indeed, in experiments of the Miller-Dollard type (25), situations are devised in which the subject learns to copy another person in order to achieve a reward. In the natural learning of the child, it may be supposed that similar conditions exist, so that the child learns how to copy and actually does so. Once, therefore, the preliminary learning has occurred, and in situations where it is understood that copying is of value, imitation of this advanced form becomes an important method of learning. Perhaps this form of imitation is of particular significance in the learning of language, for after the basic sounds are mastered by the child, he can employ them to copy any word in the language (25).

Other proposed forms of imitation, as suggested above, are variations of these two and represent other situations in which an individual behaves the way others do because that is the only way to achieve a goal (Miller and Dollard's "matched dependent" behavior, 25), or because independent stimuli lead to the same response at the same time ("same" behavior, 25), or because people are exposed to similar stimuli and react similarly (10), etc.¹¹

Suggestion A second way in which people influence the child in social learning is by suggestion, or "alteration, from without produced indirectly," because the suggestive external influence has "a peculiar meaning for the individual by virtue of which it works certain changes, the nature or source of which are unrecognized by that individual" (9). Research on suggestion, as pointed out by Murphy, Murphy, and Newcomb (29), has been varied, but most of it has added very little to our understanding of its role in social learning, since the experiments have often been merely demonstrations of "human gullibility." Its origins can be

¹¹ The 'translation of attitudes' cited by G. W. Allport (2, p. 156), although of possible importance, can be explained as a conditioning process.

standing, it is important to study them in the child under normal circumstances not in retrospect through reconstruction of adults or through disturbances in problem cases or neurotics

REDIRECTING ACTIVITIES

In addition to the processes described in the preceding pages, which are associated directly with interpersonal relationships in social learning, the internalization process works through other kinds of mechanisms. These, too, depend upon the central affectional relationships in which the child is involved but represent, rather, general trends resulting from social learning. "Repression," the theory of which is basic to the psychoanalytic view of development, is one of these. It is 'the exclusion of painful and unpleasant material from consciousness and from motor expression' (16). It is said to be a mechanism by which ideas or impulses which might have painful consequences are prevented from becoming conscious (primal repression) and by which painful ideas or impulses are pushed back into the unconscious (afterexpulsion). Both these forms of repression obviously depend upon previous learning, in which controlling systems have been established. The child must first learn what impulses and ideas are acceptable and must learn that they lead to either approved or disapproved (and therefore punished, or painful) results. In any case, it can be seen that repression has vast importance in directing the child's behavior along lines acceptable to others. In due course of time, both kinds of repression come to constitute powerful determinants of action, thought, and feeling. On the one hand, they determine the outlets through which impulses can be expressed and on the other hand, determine the fate of those which are consciously recognized by the individual.

Repression has been extensively investigated by psychologists (cf 34 and 36 for reviews, Gould, 15, and Glixman, 14, have made typical experimental studies). In general, the results of these experiments merely confirm the fact that repression can and does occur. When the case studies of psychoanalysts are added to these data we can readily understand repression's importance in the learning process. It would, however, be very valuable to know more about it at the direct level of the early learning of the small child.

It is also a distinct limitation to our understanding of repression that so many of the data have been derived from the study of neurotics. There is a subtle tendency to regard it as undesirable or bound up with pathological phenomena. In the present connection, therefore, it is essential to recognize that repression is also perfectly normal, indeed, it is vital to the internalization process, since it is a powerful force in the establish-

in well-adjusted children as a response to the distress of persons they love, and (5) conventional morality or duty, which is often used as an overt bid for approval.

Like imitation and suggestion, sympathy becomes an important mechanism of social learning, once the preparatory conditions have been established. By means of it, the child reacts to, and participates in, the emotional experience of others and, by so doing, undoubtedly learns to adapt to society and to link his own emotional responses to those of others. Further, by sharing the emotional responses of others, he perhaps comes to understand and recognize his own emotions better.

Of course, introjection, imitation, suggestion, and sympathy do not cover completely the influence of others in social learning; indeed, systematic study would undoubtedly result in the formulation of other principles, perhaps among them many simply taken for granted in common-sense psychology. Perhaps the most serious omission is that aspect of social learning in which the parents or others exert positive, direct effort to guide and modify the behavior of the child. For want of a better term, this might be called the "discipline" mechanism of social learning, although this term is obviously inadequate; for one thing, it conveys only the vaguest notion as to how the learning takes place. Nevertheless, it is necessary to recognize the positive, effortful, and direct factors in social learning.

Although the preceding discussion has indicated the directions in which research is much needed, it is pertinent to define them explicitly. In general, the whole area of social learning is poorly understood at the present time. Most of our data on learning relate to the memorizing, or problem solving, or conditioning activities of adults. Yet experiments like those of Miller and Dollard (25) and Murphy (30) suggest that social learning in children can be approached through adaptations of laboratory techniques. To complete the famous triad, it may be that the role of suggestion in the learning of children can be objectively investigated. This might require a greater appreciation of the central affectional relationships than has hitherto been characteristic of the experimental psychologist. That is, the experimenter may have to become an object of identification or an acceptable figure of authority before the child subject can be studied meaningfully in learning situations. If this notion were to be followed up carefully, methods might be found for exploring many of the specific learning mechanisms which operate in the child, about which only hints have been contained in this chapter.

The central affectional relationships, too, require study, especially with respect to their significance in learning instead of with the customary emphasis, rather vaguely defined, on personality. To achieve this under-

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Horney, 17) Mowrer (27) suggests that anxiety is a learned response which serves to warn the individual of threatening situations, *i.e.*, situations which in the past have had harmful or painful consequences. Hence it has an adaptive function in preparing the individual for situations of those kinds. In a general way, it may be said that anxiety is essential in the learning of the child. In seeking to carry out his wishes and impulses, the child continually meets with frustration of various kinds and degrees, which arouses anxiety. In order to relieve the pain associated with anxiety, the child must adopt new and acceptable modes of behavior.

Although we have dealt separately with these processes of social learning, it would be a mistake to regard them as distinct from each other. Rather, they are bound together and complement each other. For example, the identification relationship undoubtedly paves the way to sublimation by presenting to the child goals and patterns of behavior which will usually be acceptable. Anxiety is undoubtedly a condition favoring repression, since, by this means at least, partial adjustment to anxiety can be achieved. Other relationships could be pointed out among other processes. Indeed, the interplay is so intricate and varied that it is no wonder that detailed case histories give an impression that the total process of social learning differs for every individual.

CONCLUSION THE MENTAL CONTEXT

Although the preceding pages have not pretended to give an exhaustive treatment of the internalization process, they have served to indicate its nature and some of the ways in which it can be explained. It is a product of the relationships which exist between the organism and the external world. It involves the active approach of the child to his environment and the action of the environment upon the child. Of central importance are the affectional relations between the child and others, especially the parents. These relationships influence and direct the child through the processes of social learning which have been defined in terms of introjection, imitation, suggestion, sympathy, discipline, repression, sublimation, compensation, and anxiety. As a result, the child learns to behave in ways specified by his group and culture and, more specifically, in ways acceptable to those who influence his development.

We have, in this chapter, reached a first, general understanding of the mental context, to which reference was made in the beginning. The internalization of experience equips the individual with particular ways of perceiving, feeling, acting, and thinking. It results in the establishment of more or less permanent selecting and regulating systems, which together make up a complex system determining the direction, characteristics, and content of behavior, symbolic as well as overt. This system, composed, as we have pointed out, of innumerable subsystems, repre-

ment of selective and regulative systems, *i.e.*, in the direction of behavior along some lines rather than others. Hence in the normal person we should expect to find that repression is generally successful, with the result that the individual behaves in ways typically acceptable to others—this behavior having its foundation in that which was originally acceptable to and rewarded by the parents.

Among the ways in which acceptable patterns of behavior may be developed by the individual are "sublimation" and "compensation." A good serviceable definition of sublimation has been given by Symonds. It is the adoption of behavior or feelings which are a substitute for the original or natural expression of an impulse or wish, and which are at the same time harmonious with the impulse or wish and socially acceptable (39, p. 405). Although strict psychoanalysts link it directly to sexual aims especially at the infantile level,¹ it is more useful to conceive of sublimation in more general terms, a possible and desirable outcome of many kinds of impulse.

Compensation may also be broadly defined. It is "a form of adjustment to a real or imagined personal defect. It is an attempt to overcome or substitute for, the defect in some way" (39, p. 440). Thus compensation also represents the redirection and modification of behavior—the achieving of new modes of adjustment—in response to social pressure. That is to say the defect itself as well as the need to adapt to it, originate in the recognition of one's own person in comparison with others.

Neither sublimation nor compensation is a simple process but, rather involves whatever mechanisms will serve the purpose of achieving acceptable modes of behavior (cf. Fenichel, 11, p. 141, on sublimation, and Symonds 39 Chap. XIX, on compensation). Both are in part a consequence of repression because there probably must be at least partially successful repression before the individual can proceed to develop the modes of adaptation included under sublimation and compensation. On the other hand they should not be regarded solely as functions of repression either. Both are positive results of learning. The achievement of sublimated behavior signifies learning to direct one's actions toward socially acceptable goals; compensation signifies learning to act in ways in which one may be successful rather than in ways in which one is deficient. They are therefore long range learning processes, the separate stages of which can be accounted for in the terms outlined above.

Finally, we may mention one other important aspect of social learning namely 'anxiety.' That it has an important relation to learning is amply attested by experimental studies (27, 42, 44, etc.). The psychoanalysts also adduce masses of evidence to show the importance of anxiety in the internalization process (*e.g.* Fenichel, 11 pp. 42ff and 132ff, and

¹ Cf. Healy, Bronner and Bowers (16 pp. 248f) and Fenichel (11 pp. 141f).

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sents the effects of past experience and the means whereby past experience continues to influence present activity

The next two chapters will further elaborate the mental context, with special emphasis on clarifying the selecting and regulating systems of thinking in so far as this can be done at the present time

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Chapter 14. GENERAL ASPECTS OF PERSONALIZED THINKING

Now that we have formulated the conditions pertaining to the origins and organization of experience, we are in a position to examine the result of this process of internalization in the thinking of the individual. This is a difficult task, for many reasons. For one thing, it is possible only for the sake of systematic discussion to separate the thinking which occurs as a function of group membership from that which occurs as a function of individual, idiosyncratic, experience. In actuality, it is a major thesis of the last section of this book that even the kinds of thinking which are regarded as general throughout a group, sex, or culture are, perforce, "personalized." The reasons for the personalizing of experience may perhaps be included under the "idiosyncratic" rubric, because all experience, whether similar to that of other people or not, happens to a particular person under particular conditions. Thus even the most strict of cultural disciplines depends upon the mediation of particular persons influencing a particular person, and even the most carefully prescribed and intensive tutorial program depends for its effect upon the motivational, perceptual, and emotional conditions of the persons concerned. Add to this the vastly important individual acquisition also discussed in the preceding chapter, and it is not difficult to see how the conditions surrounding the internalization process lead to a personalizing even of the experiences apparently shared with others.

Another source of difficulty lies in communication. Here, of course, is a historical psychological problem. The scientist has not yet been able to observe and analyze human thinking directly. It is always necessary to infer the characteristics of mental organization from the outside, and this is true, although in a different sense, for the introspective method, as well as for experimental, case history, public opinion-survey, and other approaches. In consequence, we are probably always dealing with an abstraction of, or an inadequate approximation to, the facts. A good illustration can be found in Chapter 7, which was devoted to concepts. There it was pointed out that concepts have intensional aspects which it is impossible to understand from the mere verbal response of the individual.

A third difficulty arises from the fact that, over and beyond the problem of communicating thought processes to other people, there exist in everyone unconscious mental activities which are not and cannot be communicated—at least not without extremely prolonged and painful effort, as in psychoanalysis. Even in this latter instance, it is quite probable that uncovering enough hidden areas of mental organization to serve the practical purposes of therapy nevertheless falls short of bringing into the awareness of analyst and patient the complete mental organization of the latter.¹

Still other difficulties could be suggested, but these are sufficient to demonstrate the obstacles which oppose our efforts to understand the characteristics of thinking resulting from the internalization process.

For convenience, we shall distinguish between two general, though interrelated, aspects of mental organization, namely, "ethnocentrism" and "egocentrism." The former term refers to characteristics or expressions of thinking which are to a greater or lesser degree common to a group of people by virtue of exposure to similar conditions of internalization. The latter term refers to characteristics or expressions of thinking which depend upon individual experience and individual personality structure.

It might assist in clarifying these two aspects of thinking to examine for a moment the literal meaning of the two words. The individual is centered both in the groups of which he is a member and in his own self. It is as if there were many barriers surrounding the individual's perceptions, mental activities, and overt acts. Some of these barriers exist in interpersonal relations, as such, and in specific contacts with the physical environment, interfering with, distorting, influencing moment-to-moment reactions. Others immure the individual within certain more general ways of perceiving, thinking, feeling, and acting, setting him apart, to a greater or lesser degree, from members of other groups as such. The first kind of barrier is egocentric, the second ethnocentric.

ETHNOCENTRISM

One major result of the internalization process, as we have seen, is that the individual acquires the characteristics of the various groups of which he is a member. This membership may be perceived vaguely or clearly by the individual (19), or it may not be perceived at all. For instance, the individual may be strongly aware that he is a Negro and this awareness may continuously influence his behavior, or he may be only dimly and occasionally aware that he is an American of English ancestry, or

¹ Assuming too that the interpretations reached are not themselves useful and convincing inferences rather than actual facts.

he may be an Eskimo living in a remote and isolated settlement, where he is not at all aware that other people different from himself exist

Even when the individual is clearly aware of his group membership, however, there are nevertheless unconscious aspects of the mental organization stemming from the long previous history of experience which has become integrated into the mental organization. The crucial point is that internalization results in ethnocentric selective and regulative systems

We are therefore concerned here with ethnocentrism as a neutral concept, with ethnocentrism as a function of group-determined selective and regulative dynamisms. This emphasis contrasts with the tendency often found in the social sciences to treat it in a negative fashion. Thus ethnocentrism is frequently regarded as the disparagement of other groups or as adverse judgments of members of other groups in comparison with one's own standards and practices. Of course, these negative aspects are important in intergroup relations, but there are also positive aspects, such as the choice and approval of associates, acceptance of ideas, favorable judgments of personal appearance, preference for various activities, objects, etc. All these phenomena, both positive and negative, depend upon the internalization of the group norms, in the sense in which Sherif (41) and Hartley *et al* (18, 19) have developed the topic.

Attempts have been made to equate the term "ethnocentrism" with prejudice (15, 26, 37). The inclination of these investigators is to speak of ethnocentrism as a definite, self-contained dimension of personality, in contrast to nonethnocentrism, in which the prejudices regarded as ethnocentric are absent. In consequence, they speak of the "ethnocentric individual" and the "nonethnocentric individual." This view of ethnocentrism is likely to be misleading. As a result of the internalization process everyone is ethnocentric, although, to be sure, with wide variations in individual pattern. Thus it may lead us astray to speak about the "ethnocentric person."² Nor does it appear necessary to equate ethnocentrism with prejudice,³ a practice which risks emphasizing only the negative aspects.

On the other hand, the studies by the group cited above (15, 26, 37) do show that complexes of prejudices characterize some persons much more than others. Hence a pattern of group-determined modes of thinking, judging, feeling, and acting may achieve a definite and general

²In short we have here a variation of the familiar typological fallacy. Luchins (28) has presented a critique of these studies in which he too perceives weaknesses in the apparently dichotomous thinking of the investigators. He also questions their use of terms like ethnocentric and prejudice since the terms are not clearly defined and since circular reasoning may be involved.

³Prejudice will be discussed in Chap. 15.

structure (26), and it may be meaningful to apply the term "ideology" to such a structure. Rather than regard such an ideology as synonymous with ethnocentrism, we prefer to include the former as but one possible expression of the latter. In short, ethnocentrism, as we employ the term, includes all aspects of mental organization which make the individual perceive, feel, think, and act in ways similar to those of other members of the groups of which he, too, is a member.

Clearly, research has barely scratched the surface of this general problem. Our sources of data lie, not only in the study of definable prejudices, in the ideological sense, but also in the study of perception and values (7, 18, 19, 31, 33, 41, etc.), in the continuing study of different cultures (22, 23, 27), in the clarification of roles and group membership (35), in the analysis of group differences, *e.g.*, through public opinion polls, in the investigation of national and international tensions (24), and in many other directions.

In the discussion to follow, we shall consider ethnocentrism in two general ways. First, we shall briefly indicate the nature of social norms and values, by defining what Sherif calls the "frame of reference" (41). Second, we shall indicate the scope of ethnocentrism in terms of differences among various groups of which an individual may be a member.

THE FRAME OF REFERENCE

The work of Sherif (41) has done much to direct the attention of psychologists toward the problem of ethnocentrism. He was able to demonstrate in a very ingenious manner how an individual's behavior is modified by the standard of performance, or the norm, set within a group. He further showed that the individual continues to function in accordance with that norm even when he is no longer in the group, that is, the simple experiments contain on a small scale the conditions of internalization which were discussed in the last chapter.

When anthropological and sociological data are added to the experimental evidence, there emerges the concept of the frame of reference. By this term is meant the fact that behavior occurs in relation to, or within the scheme of, the individual's own mental organization, which is derived, as we have seen, in part from the internalization of norms and standards which were originally external to the individual. Once norms have been internalized, they serve as anchorages, or reference points, in later behavior, *i.e.*, they become incorporated into the selective and regulative systems of the individual. Since the originally external norms characterize to varying degrees all the members of the group to which they apply, we can speak about them in general, as well as in individual terms, *i.e.*, they are ethnocentric phenomena.

Instances of frames of reference are easy to find, once their existence is understood. Examples could be multiplied from such areas of behavior as etiquette (table manners, relations between the sexes, modes of address), patriotism (proper respect for the flag, rising for the national anthem, responses to national heroes and slogans), religion (attire worn in church and on religious occasions, responses during the service, behavior toward the minister or priest), education (behavior in the classroom and toward the teacher, behavior in terms of the school schedule), emotion (modes of expressing anger and aggressive impulses, modes of revealing and satisfying sexual interest, patterns of laugh responses), perception (specified responses to signs and gestures, symbols which attract attention or are ignored, stimuli which arouse sexual interest), and so on indefinitely.

The frames of reference in terms of which the individual functions are commonplace to him, and it is only when different behavior occurs that the norms, as norms rather than as accepted and natural requirements, become apparent. The new or different behavior may be regarded as strange or reprehensible,⁴ but the observation of different behavior associated with different norms provides an important clue to the fact that different persons acquire different selective and regulative dynamisms during the internalization process. From here it is a comparatively easy step to recognize the relativity of all ways of acting, feeling, thinking, perceiving, that is, behavior is relative to the norms which characterize the groups of which the individual is a member and which have been internalized.

In short, ethnocentrism is one major consequence of the internalization process. The individual's thinking, to a greater or lesser degree, is similar in many ways to that of others who are exposed to the same norms, members of the same group think in similar ways, since they possess similar frames of reference.

GROUP DIFFERENCES

Evidence of ethnocentrism, as we understand it, may be found at almost any level of generality that we wish to define. It all depends upon the group we are speaking about. For convenience, however, four degrees of generality may be recognized as possessing important implications for an understanding of ethnocentrism. First, and most basic, is the cultural group, as discussed in the preceding chapter. We shall take cultural differences for granted here. Second, there are subcultural groups, such as nations belonging to the same general culture, like the

⁴ Ethnocentrism is sometimes defined in terms of this kind of reaction, but, as noted above, it is only one aspect of it.

Western democracies, the Arab nations, the tribes of the Philippines, regions, like, in America, New England, the South, the Pacific Coast, urban vs rural areas, and groups within the same culture of different national-racial origin, like, in America, Italians, Poles, Irish, Scandinavians, Chinese, Negroes Third, there are groups which cut across many, or all, of the foregoing, to which people belong by virtue of some more specific role or set of social determinants Thus people fall into groups based on age, sex, caste, social class, religion, political party, amount of education, and occupation Fourth, and usually of most immediate functional importance to the individual, there are more specialized, smaller groups, such as social cliques, neighborhood gangs, lodges and clubs, professional organizations, precinct clubs, religious sects, and the like

The task of pointing out differences in thinking among members of different groups or similarities in thinking among members of the same group is very difficult The most obvious reason lies in the fact that research on group differences has concentrated almost exclusively on intelligence-test scores and personality traits, although these data are not unrelated to thinking, to bring them to bear on the question requires much speculation Another reason lies in the question of how significant apparent differences really are For example, the results obtained in a public opinion poll on one occasion may be completely contradicted on another, an indication, probably, that only temporary, surface phenomena are being measured Similarly, data in other areas in which groups are compared at the outer, or expressive, level, suggest that only superficial differences are involved This is not to say that such differences may not have their practical importance, they may not be as trivial to the advertiser or the politician as they are to the psychologist Rather, we mean to stress that evidence alleged to reveal the characteristics of thinking needs to be treated cautiously Still another source of difficulty rests in the very complexity of group membership The same individual obviously belongs to many groups, and two individuals who belong to the same groups, *e g*, two sisters, are marked by different patterns of membership intensity, participation, learning, etc In studies of group differences, therefore, the complexity of multiple roles and individual patterns of internalization inevitably makes for very gross results

All this does not mean that systematic studies cannot be made It does mean that masses of data are required, with an orientation toward seeking underlying selective and regulative dynamisms, that is, searching for "congruence" (3), rather than mere "correspondence" We shall attempt to clarify this important problem further in the next chapter

Klineberg (24) has reviewed in detail the question of group differences

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and lineage permeates their behavior. They participate very little in community or political affairs but maintain themselves apart from, and above, the rest of society. The middle class stress individual wealth, economic security, and success in community, business, and professional leadership. They are much preoccupied with moral and religious concepts and strive to maintain "appearances." Self- and community improvement are important goals. The lower class are economically insecure, unorganized, and isolated from the rest of the community. They "disdain" the laws, practices, and values of the classes above them.

A study which has important bearing upon ethnocentrism in social-class relationships has been conducted by Luchins and Luchins (29). They suspected that students in the "bright," "average," and "dull" classes, in elementary schools in which pupils are separated on the basis of ability, differ in their frames of reference and that these might be associated with segregation by ability. Accordingly, they obtained answers to several questions dealing with choice of class, if it were optional, parents' preference, the behavior of the teacher, and choice of friends. A very clear picture emerged, suggesting that an intellectual caste system existed in the school.¹ The 1 class (bright) was preferred by a majority of the students, regardless of the one in which they had been placed, and parents, similarly, regarded the 1 class as preferable. The most striking result, however, was that pupils in the 1 class stated that they would choose their best friends from that class, whereas a majority of the pupils in other classes (average and dull) said that they had no preference but would choose friends from any class. In this situation, then, we have on a small scale, and at a comparatively simple level of development, an instance of ethnocentrism analogous to that operating in society at large among social classes, racial groups, occupational groupings, and the like.

Related to social classes are occupational strata, of which Centers has made an extensive study by means of a polling interview technique (8). The results are broken down according to seven urban occupational groupings—large-business, professional, small-business, white-collar, skilled manual, semiskilled, and unskilled—and two rural groups—farm owners and managers, and farm tenants and laborers. Centers reports many interesting differences regarding job satisfaction and frustration, aspirations, and values and desires. Table 9 presents a sample of these data. The pattern of what is valued in a job differs for each of the groups. Note, for instance, the high value placed on leadership by the large-business group (it is twice as high a proportion in this group as in any other).

¹ The authors point out that segregated grouping of itself, was not the only condition responsible. Attitudes of parents and teachers were also influential.

at the national level.⁵ His report is an excellent and essential preliminary step toward clarification of problems and methods. It reveals how very little we actually know about differences among nations. At the same time, he has marked out many directions in which analysis can be made. For example, clues can be sought in reports by anthropologists of various national groups, in vital and social statistics, *e.g.*, those dealing with suicide, crime, and mental illness, in the kinds of psychiatric disorders prevalent in different nations, in the different cultural products of nations (movies, literature, etc.), in the intensive observation of specific communities, in the results of questionnaire, attitude, and public opinion surveys, and in many other directions.

We are left with essentially a commonplace conclusion: peoples of different nations even within the same general culture, have different frames of reference, members of one nation differ, at least in general ways, from members of another nation. It becomes a matter of international importance, as Klineberg urgently points out, to investigate these different modes of thinking to the end of understanding their role in relationships among nations. Here, then, is a major area in which ethnocentric factors enter into thinking. The individual is an American, or a Canadian, or a German, or a Japanese, and to some degree thinks as such.

Let us turn now to another kind of ethnocentrism, that associated with membership in a particular social class. Davis, Gardner, and Gardner have made an intensive analysis of both the white and Negro castes in the South (10) and have summarized in a special article the class system of the white caste (11). They describe six classes: upper-upper, lower-upper, upper-middle, lower-middle, upper lower, and lower-lower. The members of each class have a definite conception, or "perspective," of the class system and relations. For example, the upper upper group regard themselves as "old aristocracy" at the top of the society, with the other classes below them ranging down to the "po' whites", on the other hand, the upper-lower class regard themselves as "poor but honest folks," with the "shiftless people" below them, and "people who are up because they have a little money" and "society," or the "folks with money," above them.

The investigators found many differences among the frames of reference of the various classes (cf., for example, 10, pp. 73-83). The upper class⁶ idealize the past, and the sense of their position by virtue of birth

⁵ His focus on the national *i.e.*, political state level complicates the problem of definition. Should culture be used in the same sense in comparing Japan or Egypt with the United States as in comparing England with the United States? Future work should differentiate more carefully between subcultural and cultural differences.

⁶ Omitting finer classifications.

and lineage permeates their behavior. They participate very little in community or political affairs but maintain themselves apart from, and above, the rest of society. The middle class stress individual wealth, economic security, and success in community, business, and professional leadership. They are much preoccupied with moral and religious concepts and strive to maintain "appearances." Self- and community improvement are important goals. The lower class are economically insecure, unorganized, and isolated from the rest of the community. They "disdain" the laws, practices, and values of the classes above them.

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TABLE 9. SOME DIFFERENCES IN JOB VALUES AMONG OCCUPATIONAL STRATA—INCIDENCE OF THE THREE MOST FREQUENT FIRST CHOICES*

Group	No.	Most frequent	%	Next most frequent	%	Third most frequent	%
Urban							
All business, professional, and white-collar	424	Self-expression	30.9†	Independence	16.5	Interesting experience	13.2
All manual workers	403	Security	21.8†	Independence	21.6	Self-expression	16.6
1. Large-business	54	Self-expression	29.6	Interesting experience	22.2	Leadership	16.7
2. Professional	73	Self-expression	36.9	Social service	15.1	Independence, interesting experience	12.3
3. Small business	129	Self-expression	30.2	Independence	21.7	Social service	12.4
4. White-collar	168	Self-expression	29.3	Independence	17.3	Interesting experience	12.5
5. Skilled manual	156	Self-expression	25.6	Independence	21.8	Security	13.5
6. Semiskilled	172	Security	26.2	Independence	24.3	Self-expression	10.5
7. Unskilled	75	Security	29.3	Independence	14.7	Self-expression, social service	12.0
Rural:							
Farm owners and managers.	147	Independence	36.7†	Self-expression	14.3	Security	10.9
Farm tenants and laborers.	66	Security	19.7	Independence	18.2	Interesting experience, social service	15.2

* From Centers (8, Table 11).

† Indicates a statistically greater incidence, ascertained only for all business vs. all manual groupings and farm owners vs. farm tenants groupings.

and the importance of social service to the professional group (it has an incidence of only 37 per cent in the large business group) In broader groupings self-expression has the greatest incidence for urban groups 1 to 4 in contrast to security for the urban manual workers, groups 5 to 7 Among rural farm owners and managers, independence is of far greater importance than in any of the urban groups

Still another area in which ethnocentric factors operate is in differences between the sexes For example, Vernon and Allport (47) found significant differences between the sexes in all six of the values which their test is designed to measure Table 10 presents these results The differences range between 6.2 and 10.9 times their respective probable errors To the extent that these results are typical of the population at large, it can be said that men, as a group, place significantly more emphasis on theoretical, economic, and political values than women, who are characterized more by aesthetic, social, and religious values

TABLE 10 SEX DIFFERENCES IN VALUES*

Undergraduates and adults	Theoretical	Economic	Aesthetic	Social	Political	Religious
463 male	31.49	31.28	27.61	29.68	31.88	28.07
313 female	28.04	28.72	32.47	31.42	28.00	31.37

* From Vernon and Allport (47) The figures are mean scores on A Study of Values

A practical demonstration of ethnocentrism in the two sex groups is found in a study of children's textbooks (9) In an analysis of 30 third grade readers, it was ascertained that girls and women characters are typically portrayed as sociable, kind, timid, inactive, unambitious, uncreative, and helpless By contrast, males are much more frequently shown as active, aggressive, constructive, and attaining success and recognition

These are but two illustrations of a fact of great significance in interpersonal relations namely, that men and women, as members of their respective sex groups, have different frames of reference, and hence think differently in many ways This again, is readily observable in everyday life Reasonable perspective on the problem has, however, only recently begun to develop in the area of psychological investigation (cf Tyler, 46, Chap. 4) The era of attempting to find differences in native intelligence between the sexes is past It is now recognized that the conditions of internalization differ markedly for the two sexes and that these alone should result in measurable qualitative differences To understand

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friendly toward the people of Japan in April, 1949, compared with only one third of the other two groups, one fifth of the college group were unfriendly, whereas one-third of the grade school group were unfriendly. In another area, namely, freedom of speech, 58 per cent of the college group supported complete freedom, compared with 48 per cent of the grade school group.

Finally, account must be taken of the fourth kind of grouping in which ethnocentrism can be observed, namely, in the small intimate, direct group. Many studies reveal the general nature and functions of such groups. For example, the extensive investigations of Middletown (30-31) by the Lynds constitute a cross section of the organization and significance of formal and informal groups in the recreational, religious, occupational, educational, etc. life of a typical community. As far, however, as ethnocentric factors in thinking are concerned, this kind of material leaves much to inference. There is a growing recognition in social psychology that the behavior of individuals within these intimate groups should be explicitly defined and analyzed (34, 42). An admirable illustration is afforded by Whyte's study of Cornerville cliques and clubs (49). Here it is made clear that definite patterns of relationship and influence exist in the gang. A code of behavior controls the individuals who make it up, and deviations from it are disciplined. Every person in the group has a mutually understood (although not always consciously stated) role, and his behavior is governed both by the generalized norms of the group and by the specifications of his position within the group.

The same principles apply, at least in a general way, to all kinds of small, intimate groups (cf., for example, Waller, 48), each of which may be expected to have a code of behavior, or frame of reference, accepted by the members which determines their thinking, to a greater or lesser degree, in areas of importance to the group. Ethnocentric factors at this level then, would be seen in the operation of this frame of reference.

It is an important question to consider, over and beyond that, the significance of role behavior, for one sees in this respect that the position an individual occupies in a group carries with it conditions leading him to think differently from, as well as similarly to the other members of the group. The leader, the lieutenant, the follower, the isolate, etc., have specific and different ways of thinking and acting. Nor can ego-centric factors (see below) fully account for this phenomenon. Although it might be possible, as Newcomb suggests (34), to determine similar characteristics in similar roles of different groups, there would nevertheless be important properties particular to the group concerned. Probably it will become more necessary, as research continues, to recognize that three, rather than two sets of factors are involved, that is, role

the nature of ethnocentrism and then to apply that concept to the two sex groups helps to clarify the issue

The results of public opinion polls also illustrate the operation of ethnocentrism. It is a fascinating experience to read through the summaries of polling results regularly contained in the *Public Opinion Quarterly*. Here are revealed the expression of all kinds of frames of reference, but most frequently those of different age groups, groups having different amounts of education, urban-rural groups, regional groups, sex groups, and political and educational groups.

Just a few examples, culled from the *Public Opinion Quarterly* for the year 1949, may be cited. To simplify matters, we shall present data only from polls of the American Institute of Public Opinion.

Regional differences are exemplified by responses to questions pertaining to civil rights. More than 35 per cent of the respondents in all regions of the United States, except for the South, in January, 1949, were not familiar with President Truman's civil rights program, yet only 19 per cent of the respondents in the South were unfamiliar with it. The South was the only region in which a sizable majority believed that Congress should not pass the program.

Another kind of regional difference is shown by a poll conducted in May, 1949. Here, nearly half the people in the New England, Middle Atlantic, and East Central states reported that they follow major league baseball, whereas only a third of the people in the Far West and a fourth of the people in the South do so.

With regard to urban-rural differences, it was found in December, 1948, that a majority of farmers are "dry" in their opinions on the question of national prohibition, whereas a majority of those in towns and cities with 10,000 population or more are "wet." In a poll reported in March, 1949, only 56 per cent of farmers expressed approval of slum clearance and low-rent housing, whereas 79 per cent of union members approved.

Age-group differences are also illustrated by opinions on prohibition. People aged 21 to 29 and 30 to 49 are much more wet than those aged 50 and over. Another kind of difference is reflected in responses to a question pertaining to the possible establishment of a "university of the world," in which Russian teachers and students would be included (June, 1949). The younger age groups were much more in favor of this idea and much less opposed than were those aged 50 or more.

Still another example is afforded by a comparison of groups with different amounts of education. On several questions dealing with international relations, college groups contrasted markedly with high-school and grade-school groups. For instance, one-half the college group were

EGOCENTRISM

Although we can identify general characteristics of thinking which are similar among the members of a group, we must recognize that all thinking is ultimately personalized, *i.e.*, it is the product of a unique internalization process and a unique mental organization. It is a problem of great importance in modern psychology to work out the principles of how this uniqueness comes about and the significance it has in the dynamics of behavior (cf. Sherif and Cantril, 42, and Syngg and Combs 43 for recent specialized treatments).

It is beyond the scope of this book to discuss at length personality formation and dynamics, although it is necessary to have an understanding thereof in order to understand egocentrism. We shall have to assume that our chapter on the internalization of experience will suffice as a background for an understanding of the role of learning in bringing about individualized patterns of thinking.

Egocentric factors in thinking may be approached in many ways, some of which we have touched upon before. For instance, it would be expected that the structure and characteristics of the individual's concepts, especially their intensional and consistent aspects, are highly individualized. Patterns of response to projective tests express the person's peculiar mental context. Characteristic modes of dealing with problem situations also have pertinence here. Case histories like that of Harry, contain rich evidence of personalized thinking.

As was true also for the principle of ethnocentrism, the idea of egocentrism can all too easily be treated in a negative fashion. For instance, the disparagement of others or reacting in a personal, or selfish manner can be regarded as egocentric. The manner in which the familiar defense mechanisms are often described may imply this negative conception. We wish, however, to emphasize that egocentrism means the effect of those aspects of the mental context which depend upon individual experience, *i.e.*, the operation of the individualized selective and regulative systems—the more or less permanent determinants of response established during the internalization process. Egocentric factors include all the tendencies to personalize experience—interpreting stimuli in individual ways, remembering some things rather than others, making particular judgments rather than others, seeking some goals rather than others, responding to other persons with a particular pattern of emotion and so on. Clearly, these tendencies can only for convenience be meaningfully separated from the ethnocentric tendencies discussed above. The distinction can be made by conceiving of the individual both as a member of various groups in which he has experiences similar to those of others and as a person who never has exactly the same experi-

as well as group membership (ethnocentrism) and individual personality dynamics (egocentrism)

As the preceding pages have shown, ethnocentrism is an extremely important result of the internalization process. Every individual acquires frames of reference which he shares to some degree, at least, with other members of the same groups. Frames of reference are the group norms as internalized by the individual. The conditions of internalization determine the extent to which they influence the individual's thinking. Hence in order to identify and understand the specific pattern of ethnocentric factors operating in the case of any given individual, it would ultimately be necessary to trace the learning history of that person. Only an approximation can be made merely from a knowledge of the groups of which he is objectively a member.

One important method of probing more deeply for ethnocentric factors in thinking than public-opinion polling permits is the use of projective-test situations. Systematic studies at the group level of analysis would contribute greatly to our understanding of the problem. A few investigators have made a start in this direction (cf. Blum's results on sex differences, 6, and Oberholzer's analysis of Rorschach responses of the Aloreses, 12). As yet, however, projective techniques have been almost exclusively employed in the study of individual cases.

In any event, the individual thinks to some extent like other members of the groups to which he belongs, and thinks about himself, other persons, and the external world fundamentally in terms of norms common to his own groups. It is not too much of an exaggeration to picture each individual drawn in varying situations to others who share membership with him in a particular group. Their similar ways of thinking may be likened to barriers which, to a greater or lesser degree, divide them from the members of other groups. It is easier to think within these barriers, because similar frames of reference characterize the members of the group, than to attempt to become aware of the frames of reference beyond the barriers. Communication is easier within the group than among groups. In consequence, ethnocentrism in thinking is revealed in both positive and negative ways. On the positive side, it is seen in manifestations of similar thinking among group members and in mutual approaches, understanding, and communication among them. On the negative side, it appears as differences in thinking among members of different groups and in rejection, misunderstanding, and difficulty of communication among them. Both positive and negative characteristics, however, depend upon the selective and regulative dynamisms established in the individual during the internalization process. These dynamisms render thinking ethnocentric to the degree that the conditions of internalization are similar among a group of persons.

(often linked together), sublimation, condensation, displacement, projection, rationalization, reaction formation, undoing, isolation, regression, and denial

Since we have already discussed elsewhere repression, introjection, identification, sublimation, condensation, and displacement, only a word about them is necessary here. The first four of these dynamisms were seen to have an especially significant role in learning, where, indeed, their relevance to egocentrism is readily apparent. They may also be observed in later stages of behavior. Thus repression, in addition to its basic function in the shaping of the individual's mental context, continues to operate in keeping thinking and acting consistent with that context. Identification relationships do not end with the fundamental ones of infancy and childhood but recur throughout life, and the individual continues to incorporate experiences associated therewith into his mental organization (introjection). Sublimation, similarly, continues to occur as the individual modifies his behavior in directions which accord with his mental context.

Condensation and displacement, although important in dreams, are not confined thereto—nor is “symbolization,” which might also be included as a dynamism. Thus a candidate for office may seem to combine in his person the characteristics of many people—one's father, Lincoln, and a favorite childhood schoolteacher, let us say. Or the devotion of a mother, lavished on a daughter, may, upon the latter's marriage, be directed toward work for the United Nations.

“Projection” means attributing to other persons and objects feelings, wishes, acts, impulses, and ideas which actually are present in the individual himself. It is a common characteristic of thinking and may range from comparatively innocuous manifestations to pathological symptoms. Everyday examples of projection may be noted in arguments and discussions in which a person assumes that someone else holds the same ideas he does. Financial transactions may involve projection, as when individual A suspects that individual B is trying to “pull a fast one” but that intention is really present in individual A. Blaming someone else for one's own errors is also a common instance of projection. It is quite probable, in fact, that projection enters to some extent into a very large part of our thinking, indeed, it is very difficult to avoid it, because, other things being equal, thinking is determined by the ongoing mental context. Hence the environment is, ordinarily, what one conceives it to be.

Ichheiser (21) describes a version of projection which he calls the “mote-beam mechanism.” In this form of thinking, the individual perceives in others characteristics which he does not perceive in himself and hence behaves as if the traits were peculiar to others. This phenomenon, as he points out, is exceedingly common. It stems from blind spots in

ences as others. We should therefore expect to find ethnocentric and egocentric characteristics in the same thought process, interrelated in a complex fashion. The ethnocentric characteristics could be identified by understanding the individual's learning history as a group member, that is, the ways in which the individual is similar to other people with whom he can be classified; the egocentric characteristics could be identified by understanding the individual's learning history as a particular person, that is, the ways in which he differs from other persons within the same group. This distinction is in accord with the scheme of internalization which was developed in the preceding chapter.

Clearly, the best method of studying egocentrism is by means of individual case histories, and it is from this source that most of our knowledge of egocentrism comes. Experimental work, however, has produced evidence of some of the general effects of egocentrism, for example, research has been concerned with personalizing factors in perception, memory, learning, and in many other directions.^{*} The net result of all the work of this kind is to emphasize the significance of egocentrism in behavior. The individual deals with the world in terms of his own mental organization.

Although some effort has been expended to identify the principles which can account for egocentrism (cf., for instance, a review by Bruner and Postman, 7),⁹ we are still far from having enough data to state them with any degree of confidence.

There is, nevertheless, one area in which considerable progress has been made in the working out of specific features of egocentric thinking, and that is in psychoanalytic theory and practice. Here a number of 'mechanisms' have been found which represent ways in which the individual's mental context influences his thinking. As Healy, Bronner, and Bowers (20) point out, the term 'dynamisms' for these egocentric factors is better than "defense mechanisms," since the former word conveys a better notion of their selecting and regulating functions than does the latter. They are not only understandable as devices for warding off threats or preventing the occurrence of impulses but may also meaningfully be regarded as functions in the guidance and control of thinking.

There are many excellent sources of information about egocentric dynamisms as conceived by psychoanalysts (e.g., 1, 13, 16, 20, 45). More than 25 dynamisms have been described by various writers. Those most commonly mentioned include repression, introjection and identification.

^{*}See Allport (2), Bartlett (4), Levine and Murphy (25), Murphy (32, Chap. 15), Postman, Bruner, and McGinnies (36), Witkin (50), etc.

⁹The principles of gestalt psychology afford an important starting point for much of this theory.

fashion, the rest under severe and derogatory criticism. There was a significant increase in the number of aggressive words appearing in the stories when the criticism was introduced, thus confirming the hypothesis that resentment of the criticism would be projected as an increased amount of aggression in the stories. His experiment and those of Sears support the psychoanalytic concept of projection and have the further advantage of providing data from sources other than case histories. They have considerable value because of their application to everyday life.

Another dynamism which has become very well known to psychologists is "rationalization." It involves explaining or justifying to the self one's own feelings, impulses, or actions, or "selecting the most acceptable from a complex of mixed motives to explain behavior" (1, p. 109). It takes a great variety of forms (Symonds, 45, lists 19 types). The familiar "sour-grapes" and "sweet-lemon" reactions are very common. Others include excusing an otherwise unacceptable act by claiming that it is an exception, ignoring another person's needs on the ground that he does not really have the need, justifying action by means of a pseudomoral principle ("Mother knows best"), appealing to extenuating circumstances, etc.

Especially interesting illustrations of egocentric dynamisms are revealed in the thinking of the Nazi war criminals, as set forth in *Nuremberg Diary* (Gilbert, 17). Most obvious are projection and rationalization, although others are also present.¹⁰ Projection is exemplified by a Nazi's attributing the aggressive aims of the Nazi party to other nations and by seeking to blame others for his own guilt. Rationalization is evident in the efforts of individual Nazis to justify their own part in the Nazi crimes by appealing to the strong personality of Hitler, by citing the necessity for taking orders, and by explaining that they had not known what was going on.

Another dynamism is known as "reaction, or reversal, formation." In this case, the individual thinks or expresses himself in ways opposite to the underlying idea or impulse.¹¹ What is ordinarily called common courtesy may actually be a reaction formation, e.g., praising a friend's work of art which one really regards as an atrocity or claiming to be fond of the hostess's rice pudding. Simple agreement may also represent

¹⁰ Ethnocentrism, too, is strikingly revealed.

¹¹ We are taking liberties with this concept, since reaction formation is fundamentally regarded by psychoanalysts as a genetic process, i.e., the "development in the Ego of conscious socialized attitudes and interests which are the antithesis of certain infantile unsocialized trends which continue to persist in the unconscious" (20, p. 228). An example would be the changing of hostility toward a parent into solicitude. In this sense, it might well have been included in the preceding chapter among the processes of re-directing activities.

the individual's knowledge of himself. Thus a college professor may condemn his colleagues for unfair treatment of students, although he himself seldom gives a grade above C, or a mother may talk about the faults of other parents without ever recognizing her own deficiencies.

Of all the psychoanalytic dynamisms, projection is the only one which has been subjected to convincing experimental verification. In addition to the type of evidence afforded by the results of projective tests, it has also received attention in the laboratory. Sears conducted two careful studies of it (38, 39). In the first, he investigated the tendency of an individual to attribute to other persons, rather than to himself, traits which he is not aware of possessing himself. He used as subjects three college-fraternity groups and had each subject rate himself and each other member of his group on four traits. The degree to which an individual possessed, in actuality, a given trait was determined by averaging the ratings assigned to him by others. The degree to which an individual assigned a trait to others was found by averaging his ratings of others. An individual was said to have insight into his possession of a trait if he rated himself in the same half of the distribution as that in which others placed him and to lack insight if he rated himself in the opposite half of the distribution from that in which others placed him. The results showed that subjects who lacked insight on the average attributed a greater degree of a given trait to others than did those marked by an equivalent degree of the trait but who had insight into it. Furthermore, those who lacked insight into a given trait gave more extreme ratings of it to others than did those with insight. It is interesting that the group of subjects who had insight into their traits displayed a marked tendency to assign to others the opposite extreme of the traits which they themselves possessed. This phenomenon Sears calls 'contrast formation,' as distinct from projection. The second experiment was concerned with the question of whether "ideas of reference," or false beliefs that others are talking about, or noticing, oneself, are related to self-criticism—on the theory that the former are projections of the latter. Subjects answered questionnaires dealing with the two variables and were rated by intimate acquaintances on items designed to test whether or not a real basis existed for ideas of reference. It was found that ideas of reference do not, in fact, agree with actual social relationships and, further, that there is a close association between ideas of reference and feelings of self-criticism. Thus projection was apparent, although Sears does not believe that it can fully account for the relationship.

Bellak has also carried out a good study of projection employing pictures of the Thematic Apperception Test (5). In two experiments, a series of 10 pictures was presented to the subject, half of them in a neutral

great need for further investigation in this area. If it is really true, as some authorities maintain, that dynamisms such as projection (about which most has been written) are pathological symptoms, then it will be necessary to invent new names for analogous phenomena in normal thinking. This writer, however, believes that the same dynamisms operate in the normal individual but with less extreme results, or in more disguised or varied ways. An interesting little study by Frenkel-Brunswick (14) is pertinent here. She devised a procedure for comparing the actual conduct of her subjects with their statements about themselves. Forty students reported their conceptions of their behavior (their scientific work, their relations to fellow students, etc.), stated their ideals and "guiding principles," and expressed their "demands upon the environment" (regarding changes in rules, for instance). These data were then compared with descriptions made by four judges of personality traits and conduct in several concretely defined situations. She found evidence of many kinds of egocentric factor. The subjects displayed "autoillusions," such as distortion into the opposite (considering that one has a certain trait in which others regard him as deficient), omission of significant characteristics of one's conduct, justification of action belittling of traits by shifting of emphasis, etc. The analysis of guiding principles also revealed egocentric thinking. Thus ideals pertaining to attitudes and social conduct were lived up to, according to the judges' ratings, far less than those dealing with achievement. Frenkel-Brunswick suggests that guiding principles of the former kind may serve the purpose of compensation for the lack of the traits and attitudes involved. It is also noteworthy that the manner of expressing guiding principles constituted a clue to their function. For instance, the subject who spontaneously added further explanation may well have been striving to justify his statement or to convince the experimenter of its truth. Frenkel-Brunswick suggests that the assertion of guiding principles may actually be an indirect expression of personal shortcomings, especially when they are given undue or peculiar emphasis. Finally, with regard to demands on the environment, she found that about one third were simply matter-of-fact statements, whereas the other two thirds seemed to be rationalizations, *i.e.*, the environment should satisfy one's personal shortcomings and help to overcome them.

Other studies have shown how egocentric factors influence the individual's relationships with other people. Sheerer (40) and Stock (44) found a correspondence between acceptance of the self and acceptance of others. Changes in self-acceptance and self-respect were accompanied by changes in the acceptance of, and respect for, others. Much more investigation in this area is necessary.

reaction formation, for instance, a wife's laughing at her husband's jokes (if she actually fails to find them amusing) or supporting a false position in an argument for the sake of expediency Sportsmanship is often reaction formation, also The good loser converts his annoyance into praise for his opponent and the good winner converts his jubilant superiority into respect for the loser

"Undoing" is thinking which attempts "to abolish or will out of existence a past experience or impression, the consequences of which have been painful" (20, p 236) Here again innumerable instances can be found in everyday life Most persons try to "live down" regrettable occurrences in the past or act and think as if the occurrences had never taken place No doubt many forms of penitence, remorse, charitable activities, religious observances, etc., are in part, at least, functions of this dynamism Undoing may also be observed on a smaller scale, as when a person refuses to admit that he made a certain statement or alleges a line of argument which he actually did not maintain

'Isolation' is "a process by which the memories of unpleasant impressions or experiences are deprived of their affective cathexis" (20, p 234) A person may belittle the strength of his emotions associated with a previous experience An earlier acute humiliation may appear very trivial in retrospect One may recall with mild amusement states of extraordinary anger or fear The objective, or dispassionate, or 'fair' appraisal of crucial issues in politics, business, family life, etc., may be in part a function of isolation

"Regression" means the reestablishment of an earlier mode of behaving Reminiscence and the reliving of past experiences are frequently instances of regression So is the common outbreak of infantile behavior in adults, such as *masquerades or irrational activity at conventions* Regressive factors, in fact, probably enter into more of our thinking than we realize Seeking advice from some respected figure, for example, may be partly a reversion to childhood dependency upon adults Quick approval of the ideas expressed by new acquaintances may be the result in part of easy relationships characteristic of school days

The last dynamism we shall mention is 'denial,' which signifies the refusal to admit painful sensations or ideas (13) The thinking of a person who sees the sunny side of life or seeks for the silver lining may be determined by this dynamism Often, when something is much desired, a person may deny the existence of incompatible ideas Embarrassment, or humiliation, or disappointment—any painful experience—may be denied

We have attempted in the foregoing pages to show how the psychoanalytic dynamisms operate in normal, everyday thinking, even at the risk of distorting the original meaning attached to them There is clearly a

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We are a long way yet from an adequate formulation of egocentrism in thinking. The fact of it is patent and commonplace. Everyone recognizes, in both himself and others, the personalized character of thinking, and we have detailed case histories to bear this out. The psychoanalysts have supplied the bases for a systematic treatment. Our growing knowledge of concepts and attitudes contains other important clues. We can state with confidence that a major consequence of the internalization process is egocentrism. Thinking occurs in terms of the individual mental context, which determines response by means of selective and regulative dynamisms.

CONCLUSION

In this chapter, we have been concerned with the general characteristics of personalized thinking. These we have called "ethnocentric factors" and 'egocentric factors'. The former depend upon the fact that the individual is a member of many different groups and hence shares, to a greater or lesser degree, similar experiences with others. The latter depend upon the fact that, despite general similarities to others, each person nevertheless has unique experiences and a self-contained mental context. The ethnocentric characteristics of selective and regulative systems make the individual think similarly in many ways, or to varying degrees, to other members of the same family, gang, sex, class, region, nation, and culture. The egocentric characteristics make the individual's total pattern of thinking different in many ways, or to varying degrees, from that of other people. Ethnocentrism signifies that the world is perceived and dealt with in terms of the norms which have been internalized by the individual, since internalized norms constitute reference points to which experience is related. Egocentrism signifies that the world is perceived and dealt with in terms of the individual's own peculiar organization of experience, including his own unique version of the social norms. The ethnocentric characteristics of thinking become apparent at the group level of observation, whereas the egocentric characteristics are observable at the individual level of observation.

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Chapter 15. ATTITUDES

In preceding sections we have often been obliged to recognize that *something* determines the response to a stimulus and controls the course of the mental activities intervening between the stimulus and the response. We have discussed at some length how learning results in the establishment of relatively permanent selective and regulative systems, and we have referred to the role of past experience in concept formation, problem solving, imagination, ethnocentrism, egocentrism—in short, in all aspects of thinking. It is now time to discuss more explicitly this side of mental functioning. "Attitude" is a term which is coming to be widely used in psychology for those characteristics of the mental context which determine the response.

The problem has had a long and confused history in modern psychology (see the reviews by Allport, 2, Dashiell, 27, and Gibson, 41). Literally dozens of different names have been given to that something in the organism which selects and regulates the response. Underlying all these terms is the idea that the organism, as a result of previous experience, is prepared to behave in certain ways rather than in other ways. Hence names like "set," "anticipation," and "determining tendency" have often been used. The background of these concepts was briefly reviewed in Chapter 4, where the experimental work of the Wurzburg school was touched upon. Investigations since that period have further developed the notion of set and its influence in the individual's performance, but they have added more to our knowledge of how it affects behavior than to our understanding of what it is. Before presenting a more general definition and theory of attitudes, let us bring the investigation of set up-to-date.

EXPERIMENTS ON SET

A version of an experiment by Supola (108) will serve as a point of departure.¹ It consists of two parts. In the first part, a series of words is flashed on a screen, with an exposure time of approximately one-fiftieth of a second. Three sets of directions are distributed in a random fashion among the subjects. Although all three groups are assigned the task of

¹ This variation of the experiment is one employed in the introductory laboratory at the University of Hawaii.

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their reaction times were shorter, on the average, than for the same responses elicited in free association

2 *Perception* Postman and Bruner (91) found that words are recognized sooner when the subjects have a simple set than when a choice is required Chapman (23) showed that perception is more accurate when

TABLE 11 RESPONSES OF THREE GROUPS WITH DIFFERENT SETS TO THE SAME STIMULUS MATERIAL*

Class of response	Group A		Group B		Group C	
	No	%	No	%	No	%
Task 1 Perception of words presented rapidly						
Real words						
Animals birds	6	8	1	2	0	0
Travel transportation	1	1	1	2	0	0
Miscellaneous	5	6	1	2	9	18
Correct†	57	71	57	88	40	80
Blank	11	14	5	8	1	2
Total	80	100	65	102	50	100
Unreal words						
Animals birds	57	36	21	16	14	14
Travel transportation	14	9	46	35	12	12
Miscellaneous	23	14	25	19	46	46
Correct†	37	23	14	11	25	25
Blank	29	18	24	18	3	3
Total	160	100	130	99	100	100
Task 2 Completion of skeleton words						
Animals birds	138	58	60	31	67	45
Travel transportation	32	13	72	37	26	17
Miscellaneous	70	29	63	32	57	38
Total	240	100	195	100	150	100

* A total of 39 subjects participated of whom 16 were in group A 13 in group B and 10 in group C

† The class called "correct" signifies the recording of the actual stimulus word

the kind of report required is specified before exposure of the stimulus than when it is specified immediately after exposure In an experiment by Leeper (59), it was evident that specific instructions, hints and advance verbal preparation facilitated the perceptual organization of pitchwork figures and influenced which of two interpretations would be made of reversible figures Training as a professional weight lifter or watchmaker, Tresselt (114) found, makes a considerable difference in the judgment

reading and recording the same words, one group is given the information that the words refer to animals or birds (group A-A-B set), the second group is told that they refer to travel or transportation (group B-T-T set), and the third group is asked simply to write down what they see (group C-neutral set). The stimulus words themselves are of two kinds. There are five real words pertaining either to animals or birds or to travel or transportation, of these, three are flashed as the first three words, one as the sixth word, and one as the ninth.² The remaining 10 words are unreal words, so constructed that several different responses are suggested, among them A-B or T-T words. For instance, a word like "pasrort," when rapidly flashed, might be seen as "parrot," "passport," or "pastor," and a word like "chack" might be seen as "check," "chuck," "chuck," or "chock."

In the second part of the experiment, sheets of paper are distributed containing 15 skeleton words, such as "_oat," "__bin," and "d_ck." The instructions are simply to fill in the blanks as rapidly as possible to make words. As an additional condition, the experimenter pretends that it is a speed task. When the subjects finish, they raise their hands and record the time called out by the experimenter.

Some typical results in this experiment are shown in Table 11. The marked effect of the three kinds of instructions is quite apparent in the crucial parts of the experiment, *i.e.*, in the response to unreal words and in the later completion of skeleton words. Although each of the three groups produced responses in all categories, the distributions of their responses differed strikingly, in accordance with the contrasting sets established by the instructions. It is particularly noteworthy that the sets carried over into Task 2, where it can no longer be said that the subjects were simply following the instructions which, in Task 1, were continually before them on the record sheet. Introspective data bear this out, because most of the subjects reported that they were not aware of any particular selection in filling in the skeleton words. This simple experiment therefore reveals several important psychological principles.

Many other experiments have demonstrated similar phenomena in a wide variety of situations. The following studies are typical.

1 Reaction Time. Baker and Elliott (8) prepared a list of words to which the same responses were very commonly given under conditions of both free association and controlled association (*e.g.*, "Give the opposites"). When the subjects had a definite set, or controlled association,

² Since it has been found that the travel transportation set is harder to establish the first two words flashed are both T-T words. Incidentally, the words used in the experiment cited here include some of Supola's words plus others specially tested for suitability.

of performance are established. These principles were that learning, or immediate recall, is superior to retention, or delayed recall, that intentional learning and retention are superior to incidental learning and retention, and that motor reinforcement facilitates learning and retention. A situation was devised to test each of these conclusions. The subjects were required to learn a list of 10 nonsense syllables and 10 three-digit numbers. Ego orientation was established by telling half the subjects that the task was an intelligence test, whereas the other half worked under typically neutral instructions. The special factors represented by the three laws of learning were included by distributing the subjects with each of the two sets among these conditions. *intention vs incidental learning* was controlled by having the subjects work in pairs, one member presenting the stimuli visually to the other, who was instructed to memorize, *motor reinforcement* was dealt with by having half the subjects write down the items on a slip of paper, *immediate vs delayed recall* was measured by testing all the subjects on the first day and again a day later. Analysis of the results showed that none of the three supposed laws holds for all conditions. The superiority of immediate recall to delayed recall is true for task orientation but not for ego orientation. Intentional learning and retention are superior to incidental learning and retention only when the subject is task oriented and plays a relatively inactive role. Motor reinforcement facilitates learning under conditions of incidental learning with task orientation.

The conclusion is inescapable that the set of the subject is of great importance in the learning situation. Performance in situations in which the subject works under the usual neutral, passive laboratory kind of condition is apparently much different from performance in which the subject is personally concerned. The very significant question arises, therefore, with respect to how generally true, in a practical sense, are the large number of learning principles obtained in the typical laboratory experiment. It will be interesting to see how many more of the accepted laws of learning will require qualification or revision when they have been subjected to the kind of analysis proposed by Alper and others.

4 *Memory* In the familiar learning-retroaction sequence, a mere change in set between the original and interpolated learning results in reduced inhibition (93). In experiments with the repeated reproduction of stories, pictures, figures, and the like, over and beyond dynamic changes with time which occur without any apparent experimentally induced set (40), it has many times been found that the course of remembering can be markedly influenced by various kinds of set (9, Chap 7, 21). In the studies conducted by Carmichael, Hogan and Walter (21), for instance, a suggestion that the stimulus figures resembled particular

of weight. One's value system is related to the recognition time for words, since stimuli expressing dominant values are more quickly recognized than other stimuli (92). Using the autokinetic phenomenon, Haggard and Rose (44) found that subjects who participated actively in the experiment and who were told that the light would move in most of the trials reported that the light moved farther and more often than did subjects who played a more passive role.

3 Learning and Problem Solving Preceding pages have contained many references to the influence of set in learning, transfer of training, and problem solving, for example, with respect to the effect of instructions. Among experiments explicitly directed toward the operation of set is that by Moore (85). He exposed three groups with different instructions to a series of tasks, including the learning of nonsense syllables, the perception of forms and colors and puzzle pictures. For the nonsense syllables, one group was asked to learn and remember, another was told that the stimuli were anagrams but was later tested for recall, and a third group was simply instructed to read the stimuli and was later tested for recall. Where forms and colors were used, one group was set for forms and tested for colors, a second group reversed this procedure, and a third group was set for both and tested for both. For the puzzle pictures, one group had general instructions, another correct instructions, and a third wrong instructions. In all the experiments, there were highly significant differences among the groups of subjects. Thus the subjects who were given relevant directions did better—another illustration of the fact that mere exposure to the conditions of learning is far from being the most important factor in learning.

Rees and Israel (98) demonstrated similar phenomena in experiments with five letter anagrams, solvable in more than one way. Definite instructions resulted in more solutions than did indefinite directions and also favored one solution over alternatives. They further showed that sets can be established by prior experience, without explicit verbal instructions, as when a training series includes anagrams solvable in only one way. Furthermore, a set may operate unconsciously, *i.e.*, in a case where the solution can be found by observing a certain order of letters. The studies discussed in Chapter 9, for example, those of Maier (73) and Luchins (70), further bear out these results. Even in conditioning, as Razran (96) has shown, sets have an important effect.

Of particular significance in the present connection are the experiments recently carried out on the comparative effects of task orientation and ego orientation in learning and remembering. The work of Alper (5) may be cited here as especially striking. She tested the validity of three generally accepted "laws" of learning when two contrasting conditions

non-sense, everyday observations "Set" is a term which seems quite suitable for all, or most of these, phenomena. It would therefore include those conditions of preparation or readiness established in, or aroused by, the current situation which control or influence behavior in that situation. Some of the complexity of this terminology arises from the fact that the phenomena to which it refers are themselves complex. That is, they include affective states, such as mood, as well as motivational conditions, such as intention to learn, cognitive or symbolic mechanisms, such as is implied in the internalization of the instructions, etc.

There is nothing in this usage of the term "set" to suggest that we are overlooking the role of the past experience of the individual in equipping him for current behavior. Rather, we mean to say that the instructions, and the conditions of the situation, establish temporary, focused determinants of behavior, they bring the individual's organization to bear upon the present situation. Sometimes set is quite explicit as in laboratory experiments, sometimes it is less so, or even very difficult to define, as, frequently, in everyday life.

The phenomena of set, of course, include only a part of the general problem of selective and regulative systems in behavior. In addition, it is necessary to recognize more permanent, deeper mechanisms. For these, a satisfactory name is "attitudes," to the consideration of which we now turn.

ATTITUDES

Perhaps of all the terms currently in use in psychology, "attitude" has received the most discussion. Numerous definitions have been proposed, and there has been a great deal of effort expended to isolate the essential characteristics to which the term refers. A few psychologists attempt to define attitude in terms of response (20, 29, 49). The majority, however, define it as readiness to respond or as some aspect of the individual's organization which leads him to behave in one way rather than in another (as examples, see 2, 6, 24, 57, 77, 87, 89, 107, 112). Allport (2) carefully reviewed the literature up to 1935, on the basis of which he formulated the following definition: "An attitude is a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related."

The definitions proposed by subsequent writers do not appear to improve that of Allport, which may therefore still be accepted as about the best one available. The essential features are that attitudes exert a regulative influence on behavior, are largely or fully the result of learning, are relatively enduring or permanent, and are called into play by

objects resulted in modifications of the successive reproductions in the direction of the supposed resemblance. The same stimulus could, in this manner, be said to resemble different objects for different subjects, with a corresponding divergence of their reproduction series.

Experiments on ego orientation have also demonstrated the effects of set on remembering. Wallen (118), Edwards (32), and Shaw (104), among others, have shown that memory processes are strongly influenced by the personal involvement of the subject. Adjectives used in rating individuals are better remembered when they are favorable and in agreement with self-ratings than when they are unfavorable and disagree with self-ratings (104). The recall of interrupted tasks is also influenced by set (4, 64). Thus interrupted tasks are better recalled under conditions of task orientation, but completed tasks are better recalled when the subject is ego oriented (64).

The well-known study by Levine and Murphy (62) is also pertinent. They found that learning and recall of material dealing with controversial issues is better when it agrees with the subject's convictions than when it is opposed to them.

5 *Mood* Leuba and Lucas (61) induced three different moods in the same subjects under hypnosis. The same pictures were very differently interpreted when the subjects were in different moods. Similar results were obtained by Bousfield (16) when he found that more pleasantly toned associations were produced by persons in a pleasant mood than by persons in an unpleasant mood.

6 *Social Situations* As examples of how set operates in interpersonal relations, we cite again the experiments of Sherif (106). In that case, the subject's judgments were strongly influenced by the judgments of other persons, so that a group norm could readily be established. In an ingenious experiment by Pepitone (90), it was found that the social "climate," experimentally controlled in an interview situation, affected the perception of high-school boys. Thus in estimating the power and approval of members of the interview board, the subjects tended to overestimate the approval of a negative, or "hostile," member and to underestimate his power. Pepitone calls this a "facilitative distortion" and shows that it varies with the degree of restraint in the interview situation and with the motivation of the subjects.

These studies, like many others, deal with rather temporary experimentally induced controlling and regulating mechanisms in behavior.³ That is, they show the relationship between instructions and other aspects of the current situation and behavior. In this sense, they confirm com-

³With the exception perhaps of investigations like those of Levine and Murphy (62).

penetrate into an individual's organization, the more we must describe the individual's behavior in terms of motives. In fact, it is convenient to think of a continuum of organization which begins with motives, continues through attitudes, and ends with sets.

A fourth distinction concerns the relation between attitudes and concepts. In this case, we can distinguish between those aspects of organization which pertain to the stimulus and those which pertain to the response,⁴ that is, concepts bind the organism to the external world. They represent the means by which the previous experience of the individual is brought to bear upon a present stimulus, as a result of which it is given meaning and, further, evokes attitudes. Concepts may be recognized whenever a stimulus is perceived similarly to preceding stimuli.

Finally, still a fifth distinction can be drawn, namely, between attitudes and overt response. Among overt responses we include uttering an opinion or judgment, filling in questionnaires, voting in an election, etc., as well as various nonverbal actions—in short, anything that the individual does. Although some investigators have recognized the necessity of making the distinction proposed here (e.g., 58, 77), there is widespread confusion about it. The chief consequence is the often unwarranted assumption that an expression of opinion is an accurate measure of an attitude, whereas it may in reality be merely a function of a temporary set. Opinions and actions are not necessarily equated with attitudes but are momentary responses which issue from the complex organization of the individual, of which attitudes are a relatively permanent feature but are subject to the regulatory functions of sets.

SUMMARY OF ATTITUDE THEORY

All of these points may be assembled, now, into some kind of order, as follows.

In the development of the individual, as learning processes act upon the organic constitution, a type of organization is achieved, which we have called the *mental context*. In a general sense, the mental context represents the past experience of the individual as it has become internalized in him. In a more definite sense, the mental context influences behavior through the operation of selective and regulative systems, having varying degrees of permanence, strength, and generality. But these systems are not entities, so much as aspects of organization, which merge into each other. For convenience, we may abstract particular aspects of organization and assign them names. We have used, for this purpose, five terms,

⁴Some discussions of attitude recognize this distinction. Krech and Crutchfield (57), for example, speak of 'beliefs' in somewhat the same way in which we speak of 'concepts'.

a considerable range of stimuli. In addition, allowance must be made for the inclusion of affective properties (57, 107). It is evident that the psychology of attitudes rests upon the assumption that responses do not occur at random or solely in relation to the current stimulus, rather, they are determined by the internal organization of the individual as it has developed until the time when the stimulus occurs.

It is necessary to show the relationship between attitudes and various other aspects of the organization of behavior. In the first place, we can distinguish between sets and attitudes. The former represent more specific, temporary regulators of behavior, established by conditions associated with the current situation, the latter represent more general, permanent regulators established in the previous learning of the individual. Some distinction of this kind is essential if we are to bring into proper relation with one another the sorts of datum summarized in the preceding section and those pertaining to deeper lying aspects of individual organization. Perhaps this could be done merely by recognizing two or more classes of attitudes, since what we call "set" is not necessarily different in kind from what we call "attitude" but only appears to differ in degree and, possibly, mode of establishment. For instance, the distinction we intend to make might be achieved by calling set phenomena "specific attitudes" and the more permanent structures "general attitudes." However, there are at least two reasons for not doing so. (1) There is no absolute dichotomy of specificity, but, rather, it varies in degree. (2) In our view, both set and attitude are involved to a varying extent in every act of the organism, set is the focusing of attitude systems. These two considerations, in combination, appear to warrant retention of the term "set" as well as that of "attitude."

A second point concerns the relationship between attitudes and traits. As we have already pointed out (see Chapter 13), traits can be thought of as aspects of organization which refer to *how* a response occurs, whereas attitudes are aspects of organization which refer to *what* response occurs. Traits therefore would be expected to overlap many attitudes, shaping, so to speak, the manner of their operation. For convenience, it might be said that the more broadly we view an individual's behavior—the more attitudes we include or the more varied the situations in which we observe the individual—the more we must describe that individual in terms of traits rather than of attitudes.

In the third place, we must bring attitudes into relation with motives. Here it is a matter of degree in a different direction—the inner-outer direction. Motives represent the innermost core of organization, the *why* of behavior, attitudes represent the more regulative systems which determine by what means the motive is expressed. Thus the deeper we

which the pathway is already definitely prepared. Or concept-attitude systems may exist, for whatever reason, so that the stimulus does not directly arouse a motive system. Or the response may be linked with the stimulus through still more direct means, so that we need only specify concept-set relations.

In the third place, we can allow for still greater complexity than the diagram suggests. At first glance, it might seem that we have made behavior too automatic and mechanical. On the contrary, what is called "voluntary," "choice," "planned" behavior, etc., can readily be seen to depend upon the principles that we are stating. For example, sets can

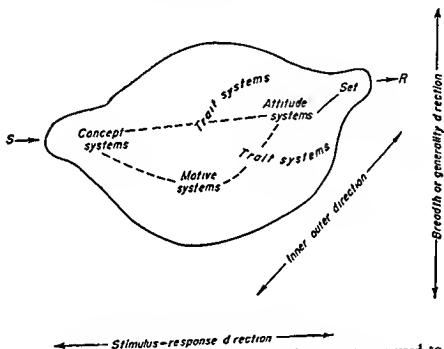


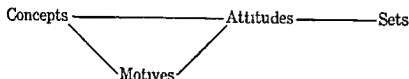
FIG 14 A schematic representation of relationships between terms used to describe organization of the mental context

easily be established which correspond to voluntary controls, as when an individual asks himself, explicitly or implicitly, "Which one of two acts is it better to make?" or as in Luchins's experiment (70), where he had his subjects write, "Don't be blind," on their papers. Individuals acquire states of readiness to allow their attitudes to be evoked, or to try out the consequences of evoking various attitudes (perhaps in a covert symbolic fashion), or to postpone evoking an attitude, meanwhile permitting new sets to become established. People acquire attitudes toward attitudes, so to speak. In order for any plan to guide an individual, it must become internalized as some variation of the concept-motive-attitude systems which we have outlined. Hence voluntary, choice, planned behavior all occur in accordance with the scheme proposed above.

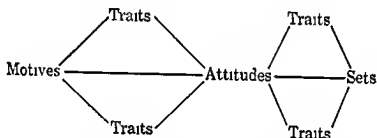
representing degrees of organization in three directions (1) from the external stimulus to the overt response, (2) from the inner components of personality outwards to the overt response, and (3) breadthwise, from one stimulus-response situation to another. For the first direction we may employ the sequence

Stimulus—Concepts—Attitudes—Sets—Response

For the second direction, we suggest the sequence



For the third direction, we present the sequence



An attempt has been made in the accompanying diagram (see Figure 14) to show these relationships. It illustrates the points outlined above. The stimulus activates concept systems, which in turn communicate with motive systems and attitude systems. Upon arousal of the latter, trait systems are also stirred up, so that the impending action of the organism is not only given a definite form but also a particular pattern of qualities, *i e*, the *what* and the *how* are both shaped. Finally, the specific response itself is selected (set) and the response occurs.

Several additional points must be clarified. In the first place, it should be noted that no sharp divisions exist in this organization. In the stimulus-response direction, concept systems merge into traits, motives, and attitudes, in the inner-outer direction, there is no definite point at which motives cease and attitudes begin or at which attitudes cease and sets begin, in the breadth direction, concepts vary from specific to more general, *i e*, have the hierarchical structure previously defined, and attitudes merge into traits as they increase in generality.

In the second place, the sequences that we have outlined are not invariable but may show any degree of fixedness or any amount of short-cutting. Thus a stimulus may violently stir up the whole organization, activating many motive systems, arousing many trait systems, etc., before some response occurs, or it may instigate a fixed course of activity for

1. Attitudes Are Inferred It might be said that the measurement of attitudes represents a kind of reasonable calculated risk, since attitudes can never be observed directly but only by the overt responses, as controlled by sets, which supposedly result from their operation. Thus there is always the possibility that a discrepancy exists between the response and the regulating system which is inferred from it.⁵ This problem becomes especially acute when the prediction of future behavior is the concern of the investigator—and it is precisely because of this possible contribution to prediction that attitude measurement has mounted in importance. In short, the problem of how justified the inference is plagues the student of attitudes.

Recognizing this difficulty, Thurstone (112) long ago proposed a rational way to cope with it. Let us use opinions (the response) as an index, he suggests, for whatever it is worth, realizing that the individual will not necessarily act in accordance with them. Let us further take for granted that attitudes are subject to change, so that some manner of determining the characteristics of such change must be provided. The possibility that changes in score are not merely the result of inaccuracies in measurement can be dealt with by proper attention to methods of calculating standard errors. Let us also assume that our measurements will be obtained only in situations in which there is reasonable expectation that the subject will tell the truth and hence provide as dependable a basis for our inference as he can. Finally, let us recognize that attitudes have many dimensions, so that reasonable effort is expended to take into account as many of them as possible.

Were investigators to heed adequately these four suggestions, much better use could be made of attitude measurement. The risk of a discrepancy between attitude and response still exists, but it might be considerably reduced.

2. Units of Measurement Where attitudes are approached quantitatively, as in questionnaires, some method of scoring must be devised. It is quite apparent that only very arbitrary quantities can be used, since no one could say that an attitude is composed of definite units, furthermore, even when a unit is agreed upon, the question arises as to how equal one of these units is to the next. Hence measurement is usually based upon the comparison of one person with another. As McNemar (77) puts it, "If we have A scoring 4, B scoring 6, and C scoring 8, it simply cannot be said with any certainty that A and B differ as much as C and B or that C possesses twice as much of the attitude as A. What can be said is that B's value differs from that of C in that same direction

⁵ Of course, something controls the response, the question is whether it is what we suppose it to be.

In the fourth place, a word must be said to reconcile the motor theory of thinking, presented in Chapter 5, with the theory of the mental context. There is no real discrepancy. The motor theory attempts to explain how thinking could work in terms of the biology of the organism. It defines a possible neural and effector basis for thinking. The present theory seeks to explain how the neural and effector structures are organized, it does not, for instance, claim any particular location for an attitude system, which, in fact, could be a system of knesthetic-cortical-muscular relationships. A motive could be a system of visceral thalamic-cortical muscular relationships. A concept could be a system of sensory-thalamic-visceral-cortical muscular relationships. In fact, the conception of organization proposed above is quite compatible with the motor theory of thinking.

Finally, it must be made clear that we do not intend to ignore the role of unconscious processes in mental functioning. On the contrary, this view of mental organization allows fully for them. The individual may be aware of the processes intervening between stimulus and response, or he may not be aware of them. There are many possibilities for indirect relations between one attitude system and another, between concepts and attitudes, etc. More than likely, there are always such indirect influences on the course of thought. Motives, according to our view, are mediated by attitude systems, which may or may not be observably related to the underlying motives. Consciousness is a matter of the degree to which the individual is aware of what goes on during thinking rather than something different from, and independent of, unconscious mental processes. Hence the conception of controlling and regulating systems presented here must be interpreted in accordance with the theory of the field of attention discussed in Chapter 3.

THE MEASUREMENT OF ATTITUDES

There is a very strong movement in the social sciences to develop standardized methods of measuring opinions and attitudes, as a means of objectifying the investigation of interpersonal and intergroup relations. In consequence, there is at present a great mass of literature on the subject dealing with methodology, as well as with the content of attitudes themselves. A full understanding of attitudes and sets, together with the problems of investigating them, can only be obtained by reviewing this material.

Certain striking problems emerge from all this work. Let us briefly consider the major methodological problems (McNemar, 77, has presented the best summary of these questions to date, the following discussion borrows heavily from his article)

appropriate and on a clear definition of what scores mean. However, McNemar (77) points out that scale analysis does not seem to cope adequately with response errors. Furthermore, Guttman's article appears to stress the use of very short scales, that is, few items, thus ignoring usually accepted standards of reliability.

✓3 *Reliability* The technical, short-time aspects of this problem are comparatively easy to solve through adequate attention to construction of items and precautions to employ the usual statistical checks on reliability. The more serious difficulty concerns the meaning of changes in scores on attitude tests over an extended period of time. Do these mean that the test is unreliable or that the subjects' attitudes have changed? About the best answer that can be given here is to refer back to the distinctions we have drawn between responses, sets, and attitudes. If, after adequate checks on reliability have been made at the time of standardization, answers to a question or scores on a test fluctuate markedly from one time to the next, it is likely that temporary sets rather than attitudes are being measured. There are many occasions, as the pollsters recognize, when our major concern is the set of the individual, on the other hand, if a serious attempt is made to measure attitudes, barring unusual circumstances, the scores ought to remain much the same over a considerable period of time. If they do not, then we are probably not reliably measuring attitudes. But there is still a need to admit that attitudes do change, and our tests should also show that. Here it is probable that some outside check on the answers to the test should be obtained, ranging from merely asking the subject himself whether he has changed to more extended, open-ended questions or interviews dealing with the characteristics of the subject's response and the factors which determine it.

✓4 *Validity* The principal difficulty, at the present time, even after McNemar's forceful statement of the issue in the field of attitude measurement, lies in the determination of validity. The great bulk of the studies which have appeared in effect ignore the question of how much correlation exists between the responses of an individual to test items and his responses to other, true-life situations. Thus many studies simply isolate the assessment of attitudes from any behavioral context. They delimit, perhaps, the regulation of verbal responses or the effects of sets, but they fail to link that regulation to behavior outside the test situation.⁶ Yet many fruitful possibilities exist for the validation of attitude tests, although most of them would carry the investigator out of the classroom or laboratory into the community. Chief among validating

⁶ This deficiency is analogous to the measurement of concepts at the purely verbal level *ie*, without regard to the intensional hierarchical and consistency aspects discussed in Chap. 7.

that A's value differs from B's " In this way, individuals can be ranked in terms of their responses, thus providing a basis for some kind of quantitative treatment Using this approach, several scaling techniques have been developed One, originated by Thurstone (112), involves a careful sorting process A number of judges arrange possible items into piles corresponding to an 11 point scale, and each item is assigned a median value Various criteria are employed to evaluate each item, such as the consistency between items and the ambiguity of an item, *i e*, the degree to which judges agree on the scale value for it In addition, items are inspected to ascertain their suitability for assessing present, rather than past, attitudes, their applicability to a wide range of respondents, their freedom from confusing language, etc

As a result of this preliminary work, the items which survive the tests are incorporated into a questionnaire It includes, as far as possible, items having all degrees of the 11 scale values The subject checks the items with which he agrees and these in turn are scored in accordance with their scale values The over all score is shown as the median of these values

A second method, as developed by Likert (65, 66), is based upon five degrees of agreement with a series of propositions relevant to the attitude(s) in question The five steps can readily be made simple and standard, *i e*, "strongly approve," "approve," "undecided," "disapprove," "strongly disapprove" Since simple scoring of 1 to 5 was found to accord very closely with weightings in terms of standard-deviation scores, the former is employed Furthermore, Likert reports that the reliabilities of Thurstone scales are just as high with the simpler scoring as with the original method Likert's system therefore is both easy to use and reliable

As McNemar (77) points out, both these methods have defects There is no reason why they could not usefully be combined Thus the Thurstone method appears to be superior in the process of selecting and evaluating items, whereas the Likert scoring system is clearly simpler and probably just as good

Still a third method, "scale analysis," has been proposed by Guttman (43) Here scoring units are worked out by defining the relation between answers to a series of questions The order in which individuals fall in answering the questions is converted into a quantitative score Thus a general attitude is broken down into degrees, *i e*, the individual who falls at one end of the scale is characterized by more knowledge of something, more interest in something, more acceptance of something—or more of some other qualitative variable which has a rational basis—than the individual who falls at the other end Clearly, this method places high premium on specifying the particular group for which the scale is

presented with ambiguous, or meaningless, or incomplete material and required to supply it with meaning. The possibilities for the development of this approach are very great. For example, Proshansky (94) found good agreement between responses to thematic apperception pictures and scores on a scale dealing with organized labor. Brown (19) has suggested a version of the Roscnzweig Picture Frustration Test to investigate intergroup hostility. It consists of simple drawings of everyday interpersonal situations involving Jews, Negroes, and neutral figures. A remark by one person is presented in cartoon fashion, and the subject supplies a retort by another person. Still another variation of this approach is found in play therapy, where very promising material can, evidently, be obtained (Axline, 7).

Disguised, Structured Methods. In this fourth kind, the subject is presented with a definite task, but the purpose is concealed, or else attitudes are revealed in some indirect manner. Campbell summarizes the requirements as "a plausible task, (a) which your respondents will all strive to do well, (b) which is sufficiently difficult or ambiguous to allow individual differences in response, and (c) which can be loaded with content relative to the attitude you seek to measure." One examines performance in such a situation to see whether there is any persistent, or consistent, tendency. For example, the many studies of selective factors in perception and memory can be regarded as attitude studies. Tests of ability to do critical thinking (Morgan, 86) can be constructed to reveal biases. Tests of information also can be adapted to the study of attitudes, e.g., Newcomb's investigation of attitudes toward Franco Spain (88). Campbell believes that the development of disguised, structured tests holds the greatest promise for the understanding of attitudes. He may well be correct. Certainly, this fourth kind of method accords very well with the conception of attitudes discussed above, and it may go farther than other approaches to solve the difficulties of attitude measurement, which have arisen largely from the use of nondisguised, structured methods.

ATTEMPTS TO ISOLATE ATTITUDES

All our discussion to this point has been based on the notion that an attitude is a relatively permanent regulating system which determines the response in more than one situation. It is apparent, then, that we think of attitudes as regulators in all the behavior of the individual.¹ In

¹ At least potentially, because as noted above the attitude may be short-cut, so that response is for all practical purposes automatic. Even here though in a fixed habit pattern or in a conditioned response the attitude is latent or may be invoked (cf. Razran '96 who has shown how attitudes may influence a conditioned response).

procedures is the comparison of "known" groups, e g, members of groups who openly espouse a particular policy contrasted with others who espouse an opposite or different policy. Another procedure involves the correlation between attitude scores and current events such as elections, response to financial appeals, taking sides in an argument, etc. In this case, useful extension could be made of the practice of comparing public-opinion polls with political events and the outcome of elections, but attempting to use attitudes rather than opinions. Much can also be done in the laboratory, as illustrated by an ingenious study by Bray (17). He compared scores on scales dealing with Jews and Negroes with actual behavior when a Jew or a Negro is present. Very little relationship existed between the attitude scores, as such, and behavior. However, in combination with personality variables, quite marked relationships appeared. This further bears out the discussion above of the many complex factors which enter into determination of the response. It certainly shows that we have little knowledge as yet of how valid attitude-test scores are—or, at least, what kind of validity they have.

VARIETIES OF ATTITUDE MEASUREMENT

Campbell (20) has pointed out that present attempts to study attitudes fall logically into four categories, as follows:

Nondisguised, Structured Methods These require the subject to express himself directly and in standardized fashion on points related to the attitude in question, without any attempt to conceal the purpose of the test or the nature of the attitude. The typical questionnaire and rating scale belong in this class, for example, those devised by Thurstone and Chave (113) and Likert (65).

Nondisguised, Nonstructured Methods These, similarly, make no effort to hide the purpose of the test but seek to obtain direct information. However, the subject is permitted to answer as he pleases or is asked to discuss a problem, from which his attitudes may be deduced. Interviews which include open-ended questions and biographical and essay material (47) belong in this category. So do the "ranks," "show-me," and "social-situations" tests used by Horowitz (48) to investigate attitudes toward the Negro. The stimuli for the first two tests consisted of photographs of white and Negro children, which subjects ranked in order of preference (ranks) and selected for companions in several situations (show me). For the third test, a series of photographs was made which depicted white and Negro boys in a variety of group situations designed to evoke judgments from the subjects (social situations).

Disguised, Nonstructured Methods These correspond to typical projective techniques used in the assessment of personality. The subject is

et al (1) seeks to define an authoritarian attitude complex in contrast to a democratic attitude complex. Another example is afforded by extensive efforts to isolate a conservative-radical attitude continuum (54, 60, 115).

One of the most coherent approaches to the isolation of attitudes is that which makes use of factor analysis. Typically, a large number of standardized attitude scales (36) or a large collection of diverse items (34) is administered to a sampling of people, intercorrelations among the scales or items are computed, and a factor analysis is conducted of the resulting matrix. In one such approach, three "primary social attitudes" were found, namely, religionism, humanitarianism, and nationalism (37, 38). In another, a conservative-aggressive factor was found (110). In a third, at least two were found, called "radicalism" and "tender-mindedness" (34).

The factor-analysis approach has a considerable promise, providing it does not become too much of a cure-all. It must be remembered that one gets out of factor analysis only what one puts in. Hence it will be important in the future to include as many different kinds of datum as possible and to explore adequately as many areas in which attitudes can be measured as possible. The risk is that too much reliance will be placed on existing tests which can readily be quantified.

Even more important, however, for the future investigation of general attitudes is the question of individual vs. group patterns. It is important to know that similar attitudes are developed in groups of persons and that they respond with some recognizable consistency in varied situations. There is a rapidly accumulating body of literature on these points. Meanwhile, it would be unfortunate if the study of the individual person disappeared from view. More intensive examination of individual attitude systems would be desirable. We have suggested in Chapter 9 that individual case study of problem solving might yield very interesting results, we might propose a similar approach in regard to attitudes. Rather than concentrate single-mindedly on the definition of generalized factors which obscure individual differences in relation to the same stimulus situations, it would be worth while to determine what factors tie together different responses of the same individual in related stimulus situations. The emphasis here would be on the definition of attitudes rather than traits, if the distinction we have drawn is meaningful. To some extent, it might involve the reanalysis or reapplication of existing scales, tests, and other devices, to ascertain individual patterns of attitudes. Probably a frankly case history method would be essential.¹ From

¹The foundations for this approach already exist. A notable instance is the research already cited of Adorno *et al* (1).

order, therefore, to define an attitude, it is necessary to identify in a series of responses something that underlies them all, at least in part. It is probably natural that this effort has been exerted mainly in the area of so-called "social" attitudes, since these are currently of major interest in the social sciences. We shall therefore use them as examples, while recognizing that systematic studies can similarly be made of parental attitudes, leisure time attitudes, work attitudes, attitudes associated with eating and meals, attitudes pertaining to the self—or of any recurring situation in which the individual can be expected to display some demonstrable consistency in carrying out motivated behavior.

It is self-evident that most studies purporting to deal with attitudes rest on the assumption that a fairly general, underlying determinant ties the separate responses together. Such a determinant, or attitude, the rationale goes, will lead the individual to respond in a consistent fashion to a number of related stimuli, or ideas. But the investigator is usually not concerned with an individual but rather with ethnocentrism, *i.e.*, attitudes which characterize groups of persons. He seeks to measure persons in terms of degrees of a common factor and hence effectually ignores individual patterns. Some studies attempt to justify the assumption of ethnocentrism by seeking for background and learning conditions which characterize individuals who display the similar responses from which the general attitude is deduced (1, 95). Most investigators, however, appear to begin with the stimulus, obtain and analyze responses, and assume that whatever general similarities are found depend upon the existence of similar background conditions, if it can be said that any assumption is made at all.

In this manner, attempts have been made to isolate attitudes pertaining to international relations (51, 95), the Negro (48), the Church (113), the feminine role (103), democracy and nazism (74, 75), and many other things. In studies of this kind, the attitudes are "named"—at least by implication—by reference to the stimulus situation, such as "attitudes toward the Negro," "internationalist attitudes," etc.

Most of these efforts get at the general, relatively permanent regulative character of attitudes by utilizing a variety of material. The minimum would be a collection of questionnaire items dealing with various related stimulus situations in which the attitude in question might be invoked. Beyond that, there may be included projective tests, interviews, information tests, etc.

A broadly contrasting type of approach to the isolation of attitudes is found in studies which attempt to cut across many kinds of stimulus situation in order to get at very general regulative systems. Thus the elaborate research by Adorno, Frenkel-Brunswick, Levinson, Sanford

condemnation, rejection, withdrawal, and the like.¹¹ In short, a prejudice is an attitude system invoked by social labels, accompanied by emotion, and bringing about an unfavorable response.¹²

In actuality, two kinds or degrees of prejudice can readily be identified, although most studies fail to take them into account (see 72). Prejudices are, first, regulatory systems which are very similar to other attitudes, although marked by the special characteristics just mentioned. They develop in the individual by virtue of the environmental context to which the individual is exposed, through the medium of the usual processes of social learning. Hence where individuals are exposed to similar contexts and learning conditions, they will, other things being equal, acquire similar attitude systems. This applies to prejudices in the first sense. They are therefore partly ethnocentric phenomena.

But prejudices are, second, personalized phenomena. Thus in varying degrees and in various fashions, they act as egocentric dynamisms in the control of behavior. They may subserve defensive, hostile, antipathetic etc., needs over and beyond, or in addition to, constituting frames of reference or internalized norms.

There are several rather clearly defined theories of how prejudices develop in the individual. The one which seems to characterize uncritical, popular explanations has been called by Zawadzki (120) the "well-earned reputation" theory, namely, that 'each group enjoys such reputation, and is accorded by other groups such treatment, as it well deserves'. The theory claims that the reputation of a group is based on a reliable source of knowledge, viz., the cumulative experience of the other group or groups. This is a normal, rational reaction to some stimuli' (120). This theory has obvious deficiencies. It does not explain the numerous readily observable irrational aspects of prejudice nor does it explain the fact that prejudices exist where it has been impossible to acquire the alleged experience either directly or indirectly,¹³ and it fails to explain the discrepancies between the alleged characteristics and the objectively ascertained characteristics of members of groups.

Another theory, formulated in general by Dollard, Doob, Miller, Mowrer, Sears *et al* (28), has been designated the "scapegoat" theory. It

¹¹ Some writers on the subject call this a negative function (e.g., Maclver 72) but the present author dislikes to call any behavior negative. It is positive in the sense that the responses are regulated but negative with reference to its effects.

¹² Kramer's lucid discussion of the dimensions of prejudice (56) accords in large part with this view.

¹³ An excellent example is afforded in the experiments of Hartley (45) in which he elicited unfavorable reactions to nonexistent groups, Danureans, Pireneans and Wallonians.

the standpoint of interpersonal relations, attitudes (and concepts), as we understand them, are just as important as traits or motives

PREJUDICE

That branch of the psychology of attitudes which can generally be called the investigation of prejudice is an extremely lively one. It is also confused. Both these conditions are understandable, since, on the one hand, interpersonal and intergroup conflict have become especially acute in recent years and, on the other hand, such conflict is the result of the interplay of extremely complicated factors.

Let us first consider the nature of prejudice. The most common approach is to define it in a general way as "prejudgment" (33, 116, 119). A little further thought, however, leads to the necessity of specifying more definitely the kind of prejudgment involved. For example, it has been suggested that "misjudgment" might be a better way of accounting for the behavior associated with prejudice and that, further, it applies to generalizations directed toward persons, groups, or social institutions (116). Other definitions link prejudice with intergroup hostility (3, 67) or with the generalization of perceived differences between groups which are judged in terms of the inferiority of one of them (50).

None of these definitions is entirely satisfactory, although all of them touch upon important characteristics of the phenomenon.⁹ Prejudice can best be understood as a special kind of complex attitude system (72). Hence all that we have had to say about attitudes, and their establishment as a result of the processes of social learning, also applies to prejudice. Thus prejudices are relatively permanent internal regulating systems, internalized during the learning process and determining what responses will occur in a variety of situations. They may be regarded as a special kind of attitude systems for three reasons. In the first place, they are invoked by special classes of stimuli, that is, by symbols (or cues to the symbols) of membership in some social group. In the second place, the prejudice activates important emotional responses, as well as verbal, cognitive, motor, etc., behavior, in consequence, a prejudice system can not be adequately described without including a specification of the distinctive emotional patterns which it arouses.¹⁰ In the third place, the responses activated by prejudices have an unfavorable character, such as

⁹ In Kramer's terminology (56) these characteristics may be regarded as dimensions, no one of which alone is sufficient to define prejudice.

¹⁰ We do not intend to say that other attitudes do not also have emotional or feeling accompaniments but rather to emphasize the special significance of emotional responses in prejudice.

account for the prolonged learning process during which prejudices are established. It also goes to an extreme opposite to the scapegoat theory by stressing the group, without allowing sufficiently for the second aspect of prejudice associated with individual personality dynamics.

A fourth theory accounts for prejudice by assuming that it results from direct personal experiences, in which traumatic events play a prominent role (18). One limitation here is that social learning, as a long-term affair, is effectually ignored. It makes the unwarranted assumption that every prejudice system depends upon some particular episode involving the stimuli which evoke the prejudice. Thus even though Allport and Kramer (3) found a high incidence of reported unfavorable memories in persons with strong prejudices against Negroes and Jews, these are far from universal. In the upper quartile of those with strong anti-Negro prejudice, only 21 per cent report such memories, and in the upper quartile of anti-Jewish prejudice, 72 per cent report them. These authors further point out that the alleged memories may very well be rationalizations rather than actual occurrences.

Finally, then, we come to a fifth theory, which is the one accepted by the author. It is the view that prejudices are *learned attitudes of a special kind* (cf. 13, 72, 76, 79, 84, 119). According to this interpretation, prejudices arise because the conditions which promote them are an integral part of the cultural context. They are internalized, as are any other group norms, through the processes of social learning and constitute internal dynamic systems which regulate responses to particular classes of stimuli. Like other attitudes, they vary in their organization and functioning in accordance with the learning conditions in the life history of the individual. Like other attitudes, they are influenced by the individual's trait system and hence display whatever qualitative variations are associated with those trait systems. Prejudices, like other attitudes, then, are both ethnocentric phenomena (dependent upon general similarities in social learning among members of a group) and egocentric phenomena (dependent upon the dynamics of individual personality).

STEREOTYPES

It has become increasingly apparent, as research continues, that the process of personality typing is an important phenomenon of intergroup relations.¹⁵ Lippmann (69) long ago pointed out the significance of stereotypes. They represent, he said, the pictures that we carry around in our heads of objects and people in the external world. "We do not so much see this man and that sunset, rather we notice that the thing is man or sunset, and then see chiefly what our mind is already full of on those sub-

¹⁵ See Klineberg's excellent review of this whole subject (55).

attempts to trace prejudice to hostility arising from personal frustrations. The hostility is displaced from the actual sources of frustration to a convenient, harmless target, usually a minority or a socially disapproved group. Justification or support for the aggressive behavior is then obtained through various of the egocentric dynamisms (rationalization, projection, reaction formation, etc.). Evidence supporting the theory is found in experiments like that of Miller and Bugelski (82). Knowing in advance that a group of young men at a camp were about to be subjected to a frustrating situation, the investigators arranged the following scheme. Ratings were first obtained of Japanese and Mexicans, half the men rating each group, by checking from a list of words those that applied to the group in question. Then a long and tedious testing program ensued, which forced the subjects to miss a much desired trip to the local bank next night. Thereafter, another set of ratings was obtained, the men who had previously rated Japanese now rating Mexicans, and vice versa. There was a significant decrease in the attribution of favorable traits. Although this study thus supports the theory to some extent, a more elaborate experimental study by Lindzey (67) failed to confirm some of the possible hypotheses derivable from it, notably that differences in reaction to frustration are apparent between individuals "high" and "low" in minority group prejudice.¹⁴ Zawadski (120) has criticized the theory on the grounds that it fails to account for the fact that prejudices are evoked by some stimuli and not by others and that prejudice works in both directions, i.e., a minority group may have prejudices against a majority. The chief difficulty, however, is the failure to distinguish adequately between the two aspects of prejudice pointed out above—the dynamics of prejudice associated with individual personality and those associated with the general social context. Certainly, the existence of the latter appears to be a prerequisite for the direction taken by the former.

On the basis of criticisms directed against the two foregoing theories, Zawadski (120) has proposed a "convergence" theory. He suggests that "intergroup prejudice is the subjective aspect of a group *conflict*, is the result of the dynamic interrelationships of the two groups, and therefore, the factors producing it must be sought in the totality of the intergroup situation." Once these conditions exist, prejudice is sustained because of benefits of various kinds which the prejudicing group gains from the prejudice. The chief weaknesses of this view are that it appears to emphasize too much the conflict aspect, which would require a tedious and unnecessary explanation to support it in all cases, and that it fails to

¹⁴ Or, rephrased in line with the formulation in this chapter, among individuals with well established prejudice systems and those with less well established prejudice systems.

to select those that belong together. Experiments with young children indicate that concepts of group membership develop very early (12, 26, 109). Nor are the overt physical differences the sole basis upon which judgments of difference are made. Springer (109), for example, found that Oriental children cannot distinguish between Chinese and Japanese when pictures are presented without identification of nationality, but they nevertheless prefer the pictures of children of their own national ancestry when they are told which pictures are which. Lund and Berg (71) had a number of judges classify large samples of elementary, high-school, and college students by appearance and speech as to region of origin (Europe) and religion (Jewish vs Christian). The results were well beyond chance. Speech, when added to appearance, had very little effect. There were tendencies to assign persons to larger and more preferred countries and to misclassify Jews as Christians, rather than the reverse. Some of these studies have compared amount of prejudice with accuracy of identifying pictures. Seeleman (102) found that persons with strong anti-Negro prejudice do not remember previously seen pictures of Negroes as well as do other people. Allport and Kramer (3), confirmed by Lindzey and Rogolsky (68), found that anti Semites are more accurate than those with less prejudice in identifying Jews by their facial appearance. On the other hand, Carter (22), in a careful experiment designed to check on the results obtained by Allport and Kramer, failed to confirm them. When provisions were made for the inclusion of Mediterranean pictures, and a threefold judgment (Jewish, non-Jewish, and Mediterranean) was asked for, there were no consistent relationships between judgment characteristics, including accuracy, and anti-Semitism. As the situation stands at present, it is uncertain to what extent Jews can be distinguished from non-Jews, or one nationality from another, within the same skin-color grouping, at least. It appears that very "representative" faces can be identified with considerable accuracy and that "typical" physical characteristics are more familiar to persons with strong interest in the group involved, for familiarity need not be a function only of prejudice. Such persons also are likely to be more confident of their judgments than are others. In general, it is highly probable that belief in, and influence by, the notion that various groups (Jewish, national, etc.) can be identified by their physical characteristics is more frequent in persons with a special interest in them.

A third series of experiments has been concerned specifically with the investigation of stereotypes. Some of these are of the "racial distance" variety (14, 15, 80, 83). In these studies subjects are asked to rate various national racial groups in order of preference and to give reasons for their ratings or to describe the groups rated. In general, explanations are given

jects" (p 88) And "foreigners," "Catholics," and "Bolsheviks" are similar in this regard to men and sunsets In functional terms, stereotyping may be defined as "the tendency to attribute generalized and simplified characteristics to groups of people in the form of verbal labels" (117) The stereotype itself is usually described as a system of such verbal labels If, however, they may properly be regarded as concepts, then the verbal labels represent only a part of the conceptual system, since it would be necessary to allow for intensional, hierarchical, and other aspects¹⁶

One group of experiments relates to the influence of names on judgment Thus attempts have been made to ascertain the effects of a well-known person's name on the judgment of public statements or literary products For example, judgments of preference for a list of authors are obtained At a later date, the subjects are presented with selections attributed to these authors but actually all by the same author Some of these studies have yielded positive results, showing that subjects tend to judge selections in terms of their estimates of the alleged authors (99, 105) Others have failed to show this effect (63, 81) Specifically with respect to stereotypes of groups, Razran (97), using photographs, demonstrated very marked effects on ratings of personality traits by attaching to the pictures Jewish, Italian, and Irish names All these experiments however, reveal that the subjects were influenced by the names, even though, in some instances, direct and simple relationships were not apparent Thus Lewis (63) concluded that the alleged name operated as a contextual factor in judging political slogans Subjects might, for example, disagree with a statement attributed to Roosevelt but would feel compelled to rationalize their disagreement In the experiment by Michael, Rosenthal, and DeCamp (81), the evidence partially supported the relationship between names and judgments for prose but not for poetry Furthermore, it is possible that there was insufficient control of memory for the previously made judgments of the selections, which may have been well recalled At the present time, therefore, more work is needed to determine under what conditions the stereotypes associated with names influence responses to those names In line with our previous discussion, this may turn out to be a clarification of relationships between various aspects of mental organization, especially between concepts and attitudes

Another type of experiment has been concerned with the ability to identify group membership from physical appearance, usually from photographs The situation is similar to a typical concept-formation situation, in which a series of stimuli are presented and the subject is asked

¹⁶ Cf Lippmann (69) and Hayakawa (46) for a discussion of stereotypes in these terms Kramer, also, in his review of prejudice (56), points out cognitive aspects which correspond in part, to this view

sexes of the same national ancestry. Hence the truly remarkable complexity of stereotyping in intergroup relations was clearly revealed. It is worth noting, in this connection, that even this study failed to allow for the existence of stereotypes pertaining to the two sexes of the same group, *e.g.*, Japanese men may have stereotypes of Caucasian men different from those they have of Caucasian women. Fernberger (39), for example, has confirmed the common-sense observation that men and women have stereotyped conceptions of each other.

In addition to proving the existence of the stereotypes themselves, several investigators have attempted to uncover the dynamic properties of stereotypes. Thus, although the verbal content of the stereotypes has considerable stability, it nevertheless has an important relation to events involving the groups characterized (42, 78, 111, 121). For example, the Negro stereotype of Italians in 1935 was strongly influenced by the invasion of Ethiopia (78), concepts of Germans have reflected the events of recent years (compare Katz and Braly in 1933, 52, with Schoenfeld in 1942, 100), and conceptions that Americans and Russians have of each other in 1950 differ from those of 1945 (55).

Edwards (30, 31) has suggested that stereotypes vary in uniformity or agreement among those who characterize, direction, or favorableness vs unfavorableness, intensity, or degree of dominant direction, and quality, or content. He found positive relationships between direction and quality, uniformity and direction, and uniformity and intensity. Schoenfeld (100), however, did not confirm some of these relationships. He found no relation between uniformity and direction (that is, various degrees of agreement may go with either favorableness or unfavorableness) and no relation between uniformity and intensity (that is, close agreement does not necessarily signify marked favorableness or unfavorableness). Only a slight relation was found between quality and direction, indicating that the favorableness of a stereotype may vary without a corresponding change in its content. Familiarity, on the other hand, bears a relation to both uniformity and direction. In the former case, groups with which subjects are not well acquainted tend to be characterized with either extreme agreement or extreme disagreement, whereas maximum acquaintance is accompanied by only moderate agreement.¹⁸ There was also some evidence that greater familiarity is associated with positive direction and less familiarity with negative direction.

Child and Doob (25) found that their subjects had a tendency to assign approved traits to preferred groups, regardless of whether or not

¹⁸ This relation at least, is borne out in another study (117), where one group of least familiarity was characterized with great uniformity (Samoans) and another with very little uniformity (Koreans).

in terms of stereotypes, ranging from vague statements of approval or disapproval to the allegation of definite traits. Other studies seek to isolate in greater detail the explicit components of the concepts. Best known of these are the investigations by Katz and Braly (52, 53). They first obtained spontaneous characterizations of 10 national-racial groups. From these, a check list of 84 commonly used terms was prepared and submitted to 100 white male college students, who indicated the 5 terms they considered to be most typical of the 10 groups. In their second study, Katz and Braly obtained ratings of the desirability of the traits on the list and preferential ratings of the 10 groups. Stereotypes were revealed in the remarkably great agreement on traits attributed to each group. Later investigators have employed the Katz and Braly method to obtain comparable data on other white males (100), white Southern women (101), Negroes (10, 78), and English subjects (35). Although these data are not all reported in exactly the same way, it is possible to compare them roughly with each other. At least one term in each characterization appeared with high frequency in all these studies, and in general there is very considerable agreement among the diverse groups of subjects. In any event, the experiments unanimously reveal the existence of strong stereotypes, at least at the verbal level.

Despite this agreement, important differences nevertheless exist between the stereotypes of different groups. As might be anticipated, the most marked discrepancy in the above-mentioned series of experiments occurs between the Negro subjects and the other groups in their characterizations of Negroes. For instance, the subjects of Bayton (10) and Meenes (78), who were Negro, did not employ some of the less favorable terms, gave different incidences of other terms, and included many terms not used by the other groups. In the light of such findings, an experiment by the present author is of interest (117). Like Katz and Braly, he first solicited spontaneous characterizations of eight national-racial groups of which six are present in substantial proportion in the same complex society, Hawaii. After a check list had been prepared, samples of these groups were asked to characterize themselves and each other, plus two other groups.¹⁷ The two sexes were also kept separate. In this fashion, it was possible to compare the stereotypes held by each sex of seven groups with respect to themselves and seven other groups. Although there were many resemblances between the stereotypes, there were also numerous differences, not only between national-racial groups but also between the

¹⁷ The eight groups characterized were Japanese, Chinese, Haole (Caucasian), Korean, Filipino, Hawaiian, Negro, and Samoan. The fourteen groups characterizing were each sex of Japanese, Chinese, Haole, Korean, Filipino, Chinese, Hawaiian, and Caucasian Hawaiian.

stances in which groups have considerable contact with each other. On the other hand, it is apparent that stereotypes are abstractions (see Haya-kawa, 46) and thus suffer from the oversimplification resulting from the abstracting process. In so far as any given person is described in stereotyped terms or is treated in accordance therewith, the errors of personality typing are, of course, very likely.¹⁹

The third point concerns the correspondence between stereotypes and prejudice. Although some authors seem to regard them as much the same thing, there are good reasons to suppose that they are not (117). For example, self-characterizations agree, in part, with attributed traits (this fact would not appear in studies where characterizations are obtained from the members of only one group). 'To say that a group is prejudiced against itself because it agrees on its outstanding traits, good or bad, appears to distort the concept of prejudice unduly' (117). Furthermore, the favorableness of stereotypes does not always agree with the over-all favorableness with which a group is described. By the same token, a group may be described with very little uniformity, *i.e.*, no definite concept may be present, at least in its verbal expression, and yet it may be judged or treated either very favorably or very unfavorably.

This last point, which has considerable significance for the meaningful incorporation of stereotyping into systematic social psychology, can be clarified by distinguishing adequately between concepts and attitudes. The former represent the systems in the mental context which are concerned with the interpretation of stimuli, whereas the latter are concerned with the regulation of responses. Thus the stereotype corresponds to the meaning aroused by a social symbol or stimulus, whereas the prejudice corresponds to the selection and regulation of the judgment or response which eventuates.

CONCLUSION

This lengthy discussion has been concerned, really, with phenomena which are relatively simple from the common sense standpoint but which turn out to be singularly difficult and complex from the viewpoint of the psychologist. For one thing, the problems of definition and theory, resting as they do upon inference, are hard to deal with satisfactorily. For another thing, the collecting of data is difficult, both because of technical requirements and because the aspects of the mental context in which we are fundamentally interested can seemingly only be studied indirectly. The position developed in this chapter is that *attitudes* represent relatively permanent internal systems, established through learning, which regulate responses in a general way. In any given situation, the specific

¹⁹ Much of Bettelheim's discussion deals with this point (11).

they were also attributed to themselves. There was a tendency to assign terms representing disapproved traits not considered to characterize themselves to nonpreferred groups, whereas disapproved terms alleged to characterize their own group were attributed by the subjects to preferred groups. As far as they go, these results indicate that stereotypes have a partly projective function.

One of the most revealing studies of stereotyping has been made by Bettelheim (11). In his article, he analyzes the dynamic factors operating in relations between Jews and anti Semites. Although he is concerned with extreme conditions, his interpretation provides a valuable theoretical starting point for an understanding of stereotyping under more normal circumstances. He points out that stereotyping is a *two-way process*, since the Jew had a stereotype of the Gestapo man, as well as vice versa, both tended to interpret the other's behavior in terms of the stereotype and to act toward the other accordingly.

There appear, in fact, to be three aspects of the two-way process, as follows (117)

1 A group stereotypes other groups and is at the same time stereotyped by them

2 A group not only stereotypes other groups but also has stereotypes of itself

3 A group tends to act toward other groups in terms of its stereotypes and tends itself to be treated by other groups in terms of their stereotypes of it. A further complication sets in by the fact that a group also tends to act in terms of its stereotype of itself

The consequences of these relationships is that stereotyping is an extremely complex phenomenon, representing an interplay of conceptual systems in the interpretation of intergroup behavior.

Three additional points remain. In the first place, as Klineberg points out (55), it is still uncertain how closely the verbal attribution of traits corresponds to the actual conceptual system. This problem is similar to that arising in the measurement of attitudes. Certainly, if stereotypes can properly be regarded as a special kind of concept in which the stimulus objects are group symbols or signs of membership in a social group, then allowance must be made for their covert aspects—intensional meaning, hierarchical structure, inconsistent features, etc.

A second question concerns the degree to which stereotypes rest upon actual, generally observable average characteristics of the group stereotyped. There is reason to suppose that stereotypes have at least a kernel of truth (for a fuller discussion of this point, see Klineberg, 55 and Vinacke, 117). It would be surprising if this were not the case in those in

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responses which occur are determined by *sets*, established by conditions associated with the stimulus situation. *Concepts* represent the relatively permanent internal systems, established through learning, which determine the interpretation of and effects within the individual of the stimulus. Other aspects of the mental organization which influence response are *motives* and *traits*, the former linking stimuli and responses with the inner-need system, the latter determining the qualitative characteristics of response. These five terms are merely convenient names for aspects of mental organization and are not to be regarded as separate, distinct entities.

Prejudices were defined as a special kind of attitude system aroused by social stimuli, accompanied by marked emotional responses, and leading to unfavorable judgments or acts. *Stereotypes* were defined as a special kind of concept analogous to prejudices, the particular characteristics of which are that they are aroused by symbols or cues of group membership and consist of personality descriptions.

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Chapter 16. PUBLIC ASPECTS OF PERSONALIZED THINKING

Our emphasis throughout the preceding chapters has been on thought processes in the individual. We have been concerned mainly with fundamental principles. It is of the utmost importance, however, to recognize that these principles extend into everyday life. What we investigate in the laboratory, the clinic, and the nursery school is not, or should not be, sharply cut off from the rest of existence. It is beyond the scope of the present book to make the indicated application with any degree of adequacy. Thus the vast realms of folklore, of art and literature, of the formulation and use of theory in philosophy and science, of the development of policy in government and politics—the workings and manifestations of human thought in all their diversity—still lie for the most part beyond the pages of a book of this kind. In preceding sections, we have sometimes stepped beyond the threshold to these areas of thinking, yet we have been forced to return quickly to the task of outlining fundamental psychological processes. It would nevertheless be a great mistake to sever our understanding of thinking from the everyday course of behavior or from the functioning of society in general.

It is our intention in this chapter to show how principles of personalized thinking can be extended beyond the organization of the individual into social relationships, that is, into what might be called "public thinking." The phrase "public thinking" probably will bring to mind, first, public opinion, the study of which has rapidly pushed to the forefront of attention in the social sciences. Certainly the expression of opinion is an important aspect of social relationships. It is nevertheless only one among many phenomena of public thinking. We shall therefore not concern ourselves specifically with public opinion, full treatments of which are available elsewhere (e.g., in Doob, 10) but rather shall adopt a broader approach.

SOME GENERAL CONSIDERATIONS

It is evident that thinking has many and important functions in relations between individuals. A person exists in society and engages in give-and-take relations with other persons. Hence although the psychology

of individual thinking may meaningfully be studied, as in problem solving, fantasy, creative situations, etc., there are a great many other conditions under which it is necessary to investigate the thinking of the individual as a member of society. In the first place, it becomes essential to examine the processes of social learning, as we have already done, because even problem solving depends in large part upon individual mental contexts, which determine how the problem is perceived, what pattern of attack is adopted, what effect errors will have, etc. In the second place, it is essential to recognize that, over and beyond social learning, there are many areas of public thinking which can be studied as phenomena in themselves. In drawing this distinction, we do not intend to make a sharp division between kinds of thinking. Just as problem solving and imagination have been defined in relative terms, so should public thinking be regarded as a matter of degree. Thus both problem solving and imaginative processes may be, and are, evident in social situations. To be sure, too, when we speak of public thinking, we realize that it is still individual persons who are thinking, not some new, bigger entity. But there are nevertheless significant phenomena which may be observed, as such, and formulated apart from the separate individuals involved.

There are at least four conditions under which public aspects of thinking are manifested

1 *Interpersonal Relations* Under this heading can be placed instances of social interaction which can be described primarily as relationships between individuals. Such situations range from those with a minimum degree of dependence upon group structure to those which occur exclusively as a product of group specified relations. Examples include ordinary conversation, casual contacts between people, give-and-take relations within a group, e.g., two students talking in a class or three persons engaging in private discussion at a general meeting, an attempt by one person to influence another, an argument on a point of order between two committee chairmen, a conflict between the leader of a group and one of the followers, etc.

2 *Mass Media of Communication* Here would be placed all attempts to deal by means of general appeals with other persons as anonymities, rather than as individuals. Obvious channels for such action are newspapers and magazines, radio and television, motion pictures, leaflets, books, pamphlets, etc.

3 *Group Discussion* Under this heading belong social interactions which occur within the framework of a group, formally or informally designed, and in which individuals treat each other, not primarily as individuals, but as joint participants in the group action. The range of this kind of relationship is very wide from informal aggregations, joined in

a purely temporary fashion, to highly structured, permanent, carefully regulated organizations

4 *Intergroup Relations* Finally, social interaction may occur in a way which can meaningfully be described at a level rather far removed from the individual. Here we mean to include actions sponsored in the name of a group and carried out by agents acting for the group rather than for themselves. Again, a considerable range can be noted, from implicit, poorly defined, essentially haphazard actions to highly organized, rigidly formalized actions. At one extreme can be found members of a committee who have been appointed to represent some segment of the community but whose presence in the group is not so verbalized and whose functions are not clear. For example, a committee may form to study prison reform. Largely by tacit agreement, individuals from various religions, minorities, special interests, and occupations may be invited, but with only vague recognition that they are supposed to represent their assumed groups. Or a student committee planning a program on a college campus may attempt to obtain wide membership among factions and cliques, often however, without defining the group representative functions of the members. It is probable that this kind of intergroup relationship is very widespread. An example of the opposite extreme would be the mediation of labor disputes or deliberations in the General Assembly of the United Nations. In the first case, the participants can quite meaningfully be thought of as labor, management, and government and, in the second case as nations, whose agents the delegates are.

All these areas of public thinking are currently under intensive scrutiny in the social sciences. Any psychological phenomenon may be studied in social situations as well as in separate individuals. In respect, specifically, to thought processes all the phenomena discussed in preceding chapters have pertinence also to social situations. Problem solving occurs in relation to other people. Social interaction has its autistic features. Creative activities may occur in the development of social products, as well as in the evolution of a painting. As we have seen already, people have concept systems in relation to social stimuli, as well as to other stimuli, *i.e.*, girls, leaders, Negroes, fathers, and buddies are all objects linked with concept systems, just as much as apples, spoons, fruit, numbers, and colors.

In short, the problems of individual psychology have their counterparts in social relations manifested in the general situations just defined. Much of the preoccupation with attitudes is directed toward an ultimate understanding of intergroup relations. Communication between members of a group is a problem in interpersonal and intergroup relations (11). The intensive study of leadership involves important questions of public

thinking in interpersonal relations (7, 22, 26) Much effort is being centered on the nature, characteristics, and effective use of group discussion as an aspect of public thinking (4, 21) A particularly active line of research has to do with mass media in relation to propaganda and persuasion and their effects on the formation of opinion and influencing action (8, 10, 13, 19, 20, 23)

In all these areas, the behavior which occurs depends upon principles set forth in the preceding chapters, that is, the actions of individuals involved in social interaction are determined by their respective mental contexts, organized into systems of concepts, motives, traits, attitudes, and sets Hence one cannot adequately understand public aspects of thinking without some knowledge of these selective and regulative systems It is in attempting to relate behavior, whether actions or judgments, to relatively permanent aspects of mental contexts that the most serious difficulties arise From the standpoint of measuring public opinion, for example, prediction problems are involved (9) Here the opinion-testing situation intervenes between the background of an individual's experience with the object of opinion (origin situation) and the future action of the individual with respect to that object (criterion situation) The test situation is an attempt to ascertain any continuities which may exist between the origin and criterion situations

This point may further be clarified by reference to the effects of propaganda, for example, in the analysis of wartime efforts to sell United States saving bonds The problem of persuading more people to buy more bonds involved attempts to influence the behavior of people at large by means of various propaganda appeals Such a campaign, to be effective, according to Cartwright (8), must succeed in arousing a definite series of responses in the individual person In the first place, it must create a *particular cognitive structure* This means that propaganda is accepted or rejected in accordance with the recipient's mental context, to be effective, therefore, propaganda must be couched in ways which will make people attend and be responsive to it In the second place, propaganda must create a *particular motivational structure* That is, it must result in activating the individual to carry out the behavior asked for To achieve this end, the appeal must be expressed in terms of, or must be directed toward, goals already held by, or acceptable to, the individual Finally, a *particular behavioral structure* must be created This requirement signifies that the propaganda must be presented in a manner and at a time which will actually make the individual do what is called for It must therefore be clear what is to be done, and the appeal must occur at a moment when it is possible and easy for the individual to perform the act

All three of these principles emphasize the necessity for connecting aspects of individual organization with overt behavior. There is an explicit recognition that discrepancies may exist between internal organization, symbolic response, and overt action. The problem is one that arises in all the kinds of situation outlined above. It is seen very clearly in the measurement of opinion, where the aim is to obtain information about attitudes by means of verbal judgments, and is evident in the need to gear propaganda to reach into the internal structure of the individual. But it is also a significant question in interpersonal relations, group discussion, etc., where surface behavior may or may not agree with the relatively permanent characteristics of the individuals involved.

RUMOR

As an illustration of how personalized thinking enters into social situations, let us consider the phenomenon of rumor. Since it has received considerable attention as a research problem, a reasonably coherent analysis can be made of it.

Rumor may be defined as "a specific (or topical) proposition for belief, passed along from person to person, usually by word of mouth, without secure standards of evidence being present" (Allport and Postman, 2, p. ix). Such propositions range from outright falsities to exaggerations or distortions of the truth. They are related to myths and legends but possess a present significance.¹ It is sometimes difficult to identify rumors, since they often verge into facts or represent mere exaggerations or relatively slight distortions. As will be apparent below, rumors may originate in factual information, which becomes changed in the course of transmission from one person to another, that is, the rumor is shaped and modified by the mental processes of the separate people involved in the communication.

Several methods have been employed in the study of rumor. Many investigators have dealt with rumors as *social products* (1, 6, 14, 15, 17, 24, 27). In this approach, rumors are collected and classified. The analysis can be based upon a comparison of the rumors with the ascertainable facts in order to find out what distortions are manifested. External criteria can be introduced to see what social factors may account for the occurrence of particular rumors. In addition, an effort can be made to apply psychological principles to explain dynamic processes.

In a second approach, rumor is treated as an *experimental problem*. Two procedures have been employed. In one, the experimenters attempt deliberately to instigate a rumor, under natural conditions, in order to observe the result (25). Although in the case discussed in Schall, Levy,

¹ Over a period of time, a rumor may become a myth or legend as appears to be the case with the celebrated Black Hole of Calcutta (14).

and Tresselt the experiment was not successful, it has interesting possibilities for further application. The other procedure, serial reproduction, is an application of standard laboratory techniques to the problem of rumor (2, 5, 16). In a group of subjects, the first person is exposed to a situation, for example, he may be asked to inspect a picture. He then transmits a report about it to a second subject. The latter transmits his version to a third person, and so on. Much of the theoretical treatment of rumor is based upon results obtained in this fashion.

The third approach stresses rumor as a social process (3, 12). Here the investigation would start with some particular rumor episode in everyday life and attempt to reconstruct the sequence of events in their natural setting, relating to each other all the relevant conditions. To obtain evidence, therefore, it is necessary to define the setting in which the events occur and to identify the persons involved. One way of doing this would be to hold post-rumor interviews with individuals variously concerned in the situation. Since obvious limitations exist in the ex post facto interpretations required, another method by which it could be planned in advance would yield more dependable data. Hence participant observation holds promise as a means of more direct investigation of rumor transmission. This technique "consists essentially of having the communication process observed by cooperating members within the social structure which we wish to study" (3). Certain serious difficulties exist here, too, notably in the fact that personal limitations of the co-operators may interfere with objective reporting and in the fact that the co-operators no longer have precisely their usual role in the group. There are, nevertheless, many advantages to this method. It would be especially effective, of course, where a particular group is available for prolonged and intensive study. Inasmuch as modern social research is increasingly directed toward this kind of study, the method of participant observation should be given careful attention.

The use of these methods has yielded enough data to permit systematic formulation of the conditions under which rumor occurs and the dynamic processes which characterize it.

Generally speaking, rumors are usually allegedly factual reports, that is, fabrications or exaggerations, explanations of events, or forecasts of the future.² Their actual content is typically an expression of a wish, "pipe-dream" rumors, of fear, "bogie" rumors, or of aggression, "wedge-driving" rumors (17).

A tabulation of rumors in wartime, classified by Knapp according to contents, revealed that wishful rumors constituted between three fifths

² This classification is borrowed from Prasad (24), who collected rumors associated with an earthquake in India. The forecasts in this instance were of an astrological character.

and three fourths of the total, fear rumors, one-fifth to one-third, and rumors of aggression, less than one-twentieth. The small remainder did not fall into any of these categories (17)

Rumors do not have any single function, but any human need, as pointed out by Allport and Postman (2), may serve as a basis for the circulation of rumors. In different persons in the rumor chain, somewhat different functions may be served, or the rumor may have a complex basis in a single person. Thus the wishful element may at times be most prominent, but at other times a rumor may more meaningfully be described as a problem-solving effort, that is, it may represent an attempt to explain "puzzling features of the environment" (2) or to provide information regarding an important event. At still other times, the rumor may be associated with one or more of the egocentric dynamisms, such as rationalization or projection.

Following a suggestion by Knapp (17), Allport and Postman (2) have formulated a "basic law of rumor," to the effect that rumor arises and tends to be transmitted in accordance with the ambiguity of the situation and its importance to the individuals concerned. Festinger *et al* (12) have endeavored to refine this relationship more explicitly, as follows: (1) *Principle of external control* "Rumors will tend to arise in situations where developments especially relevant to people's existence lie largely outside their own control" (2) *Principle of cognitive uncertainty* "Rumors will tend to arise in situations where cognitive regions especially relevant to immediate behavior are largely unstructured."

Once begun, rumor transmission manifests striking dynamic processes, a kind of 'creative embedding' (2) or "integrative explanation" (12), that is, modifications of the original report occur which tend to make the story more coherent, simple, and complete (2, 12, 16).³ More specifically, processes which might be called "leveling," "sharpening," and "assimilation" can readily be identified (2). By leveling is meant the tendency for details to be omitted and for content to become more simple and brief. Sharpening refers to the tendency for the report to emphasize prominent elements by exaggeration, utilization of familiar symbols, stressing of novel features, etc. Assimilative changes are those which tend to make the report agree with the mental contexts of those who transmit it. Thus distortions may lead to greater plausibility, to expressions of prejudice, or in other directions.⁴

³ Thus they exemplify the gestalt law of *Pragnanz* (cf Koffka 18 p 110).

⁴ It is interesting to note that newspapers reflect such selective factors in their treatment of rumors. *e.g.*, Zerner (27) found that Paris newspapers tended to pass along to their readers items about an alleged illness of Stalin in accordance with their seeming policies toward the USSR.

Festinger *et al* (12) were able to collect very full information about one particular rumor episode, permitting them to analyze its origins and transmission. In consequence, they were able to point out, nearly at first hand, some of the most significant aspects of the process of transmitting rumors. For example, they noted that certain persons by virtue of their positions in the group in which the incident occurred, played vital roles in the communication process. At least three such roles were identified, namely, a scapegoat, someone who had characteristics, in her personal life and in her participation in the group, which rendered her a convenient target for the rumor, an active instigator in this instance, someone whose position was threatened and for whom the rumor served ego-centric functions, and passive supporters, who transmitted the rumor and for whom, also, it had the kinds of function previously stated.

Their analysis showed further that rumors depend upon the total social context for their origin and persistence. Thus the content of a rumor is determined, not at random, but by conditions of readiness at the time. The rumor about which they report contained an accusation that the scapegoat was a Communist. It was shown that a state of readiness in this direction probably existed in the group as a reflection of a considerable increase in the space devoted to communism in local newspapers just prior to the rumor.

Again the structure of the group influenced the course of transmission. The rumor was much more likely to be heard from friends than from acquaintances or other persons, by persons for whom the rumor had especial relevance, or by individuals who had participated actively in community affairs. The investigators found that these three factors were largely independent of each other, suggesting that a rumor is propagated simultaneously along several lines of communication.

Somewhat different factors appear to determine whether or not a person who hears a rumor will pass it along. Although active participants in community activities not only hear rumors but also tell them to others, the same is not true of friends. In this case, special motivational conditions seem to be necessary over and beyond mere friendship.*

Finally, it should be pointed out that rumors may be counteracted in various ways if forces are brought to bear upon them. During the war, for example, it was found that "rumor clinics" in the newspapers materially reduced the tendency of persons who read them to believe in rumors (1). In the study by Festinger *et al* (12), cited above, several constructive steps were taken after the rumor was discovered to counter-

* Allport and Lepkin (1) also found differences in susceptibility to rumor among occupational sex and age groups but more evidence is needed before definite conclusions can be drawn.

act it, with very good results. In general, the program consisted in supplying adequate information on points on which previously it had been lacking and in deliberately capitalizing on the known structure of the group to rectify conditions responsible for the rumor.

PERSONALIZED THINKING IN SOCIETY

To sum up, then, we can easily see that the psychology of thinking extends far beyond the behavior of any single individual into the fabric and functioning of society itself. We have discussed the phenomena of rumor as an illustration of this point. This reveals the fact that the behavior of individuals in society—specifically, their communication with each other—is determined by the mental contexts of the persons involved. Selective and regulative processes are apparent. Further, the phenomena of rumor, as of other public thinking, nicely exemplify the interplay of realistic, imaginative, egocentric, and ethnocentric factors in thinking.

Rumor is but one example. The psychology of thinking has equal significance in the other realms of public thinking, such as in group discussion, intergroup relations, behavior in relation to mass media of communication, and interpersonal relations other than rumor transmission.

We have merely set the stage for the extension of psychological principles into all these areas.

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Chapter 17. CONCLUSION

In the preceding pages, we have set forth in considerable detail the results of research pertaining to the psychology of thinking. We have shown that this investigation, in common with that in other areas of psychology, has emerged from an extensive background in philosophy, the social sciences, the natural sciences, especially physiology and the study of the nervous system, and psychopathology. Within psychology itself, the great historical movements have all contributed important and fruitful theory, hypotheses, methodology, data, and conclusions. Thus we have found that associationism and structuralism developed theories of the nature of mental content and activities which have been influential in the study of attention and have been instrumental in the development of the psychology of sets and attitudes. Behaviorists (and William James) attempted to discover a workable basis for thinking in the bodily processes of the individual. The trends toward emphasizing dynamics and organization began most recognizably in psychoanalysis and gestalt psychology.

We have been concerned at many points with clarifying the kinds of problem which confront the investigator of human thinking and with indicating the methods which have been used to deal with them. It is evident that certain experimental techniques have most frequently been employed. Observation of behavior under controlled conditions has usually signified a laboratory procedure, with a neutral recorder, careful controls, apparatus, masses of quantitative data, statistical analysis, and the drawing of conservative and objective conclusions, within a fairly narrow framework of theory. This pattern has especially characterized research pertaining to the transfer of training, concept formation, and problem solving—areas in the psychology of thinking which are most conventionally included within the scope of American experimental psychology.

Nevertheless, important results have been obtained in other ways, too. Introspection was a standard method in early studies, is still used occasionally, and is capable of yielding valuable data in the future. Clinical methods, including the free association of psychoanalysis, interviews and case records, and projective tests, have added invaluable information. We have called upon research with these techniques, particularly with

reference to autistic thinking, social learning, and egocentrism. Various observational methods, as developed in child psychology, anthropology, sociology, and social psychology, have also contributed to our knowledge of thinking. Such techniques have been utilized in the study of imagination, the internalization of experience, ethnocentrism, and public thinking. Finally, specialized interview and testing procedures have evolved for the study of attitudes, opinions, and public thinking in general.

The fact that certain methods have had greatest use in certain areas does not (or should not) mean that they are mutually exclusive. It is partly a historical accident. There is no reason, however, why the same problem cannot be investigated in more than one way. In fact, we have frequently noted points at which a varied attack has yielded, or would yield, a better understanding than could be obtained from a restricted approach. Hence it can be suggested that investigators of thought processes should have many strings to their bows, in order better to be versatile hunters of answers to the questions which await them.

What picture of mental processes, then, emerges from all this work? We first attempted to place thinking within a meaningful behavioral framework. To this end, in particular, two theories were developed in some detail. The first concerned the specification of general relationships between the organism and the environment in the *field of attention*. The second dealt with the question of how thinking can occur at all and contrasted *central theories* with a *central-peripheral, or motor, theory*.

It was pointed out that thinking represents a continual interplay in the organism of forces from the external environment and from within the individual, associated with cyclic need conditions and the effects of previous experience. At a given moment, if a cross section of mental activity can be conceived, three levels of awareness would be evident. One is the level of full awareness, or consciousness, another is a zone of transition, and a third is a level of unawareness, or unconsciousness. The boundaries of these three levels were defined in terms of stimulus thresholds. The area of transition is bounded, on one side, by the psychological threshold and, on the other, by the physiological threshold. From instant to instant, the thresholds vary. In order that a stimulus (either from within or from without) may penetrate into awareness, it must fall above the shifting psychological threshold, if it falls below the physiological threshold, it cannot enter into consciousness. Thus the field of attention can be defined either in terms of a scale of stimulus properties, such as intensity, duration, size, etc., or in terms of neural properties, such as availability of pathways, inhibition, etc.

As for the two theories of how thinking works, one is little more than a generalized description, the other attempts to define a possible mech-

anism for thinking. The first, which can be called a "central theory," simply allocates thinking to the brain. It may, of course, be the correct theory. On the other hand, substantial preliminary experimentation and a coherent interpretation lend support to the *motor theory*. Here, mental processes are said to be linked with bodily, or implicit, activities, with the brain serving as an integrating and selecting center. Sequences of much-reduced, or implicit, muscular (smooth or striped) contractions and kinesthetic impulses, organized in the central nervous system, are advanced as the basis for thought. This theory originates in a simple stimulus-response psychology and has the advantages of seeming clarity and tangibility. Consideration of certain limitations in the theory led to a proposed revision which would take into account more complex selective and regulative systems than were envisaged in the original theory. At the present time, with such revisions, the motor theory appears to give a more comprehensible explanation for how thinking can take place than does the brain theory.

After outlining the general nature of thinking, we turned to an extended exposition of the phenomena of mental activity. It rests upon the formulation of three principal aspects of thinking, namely, (1) *realistic thinking*, or reasoning, (2) *imaginative thinking*, and (3) *personalized thinking*. This division is merely for convenience. In actuality, thinking is an interplay of response to outer, or realistic, and inner, or imaginative and autistic, forces which occurs in relation to the mental context, or personalizing factors.

Outer determinants are most likely to prevail in *logical thinking*, in the laboratory type of *concept-forming* and *transfer* situation, and in *problem solving*. We therefore linked the realistic pole with conditions of these kinds. *Logical thinking* is that which takes place in relation to propositions, generalizations, symbols, and the working out of relationships according to rules of procedure. It was evident that the nature and results of logical thinking depend upon the character of the material with which the reasoner is dealing. Furthermore, even apart from the specific propositions themselves, *i.e.*, their 'truth,' or importance, or adequacy, it has been found that psychological conditions, like "atmosphere" and personal conviction, influence the course of thinking.

Concepts can be thought of as systems in the mental organization which link stimuli with the individual's past experience. It was shown that the "name" of a concept really stands for a complex system, including extensional and intensional meanings, consistencies and inconsistencies in organization, and hierarchical structure (horizontal and vertical).

In discussing the *transfer retroaction sequence*, our main concern was to show that a dynamic and continuous course of events is involved,

rather than isolated, self-contained phenomena. Thus learning in a given situation is not separate from previous experience, successive learning situations are related to each other, remembering is influenced by preceding phases of the sequence, and the whole process can be extended into later phases of behavior. We further emphasized that the sequence depends upon the conditions which influence the individual in successive stages, such as practice, the nature of the materials, and personality factors.

In *problem solving*, behavior has three phases, each susceptible of psychological investigation, designated as (1) confrontation by the problem, (2) working toward a solution, and (3) the solution or failure to solve itself. Research on problem solving has revealed trial and error behavior, insight phenomena, and many other processes. These data lead to the recognition that what processes occur depends in part upon the conditions of the problem situation, thus trial and error is sometimes necessary for solution, whereas at other times recentering is required. We distinguished between blind behavior and insightful behavior, neither of which is necessarily linked with a particular mode of attack. Indeed, we found it necessary to differentiate between modes of attack, processes which characterize solving activities and kinds of solution. Well defined modes of attack include trial and error, insight, and gradual analysis. Processes of solving include apprehension of the problem, effort to deal with it, manipulation and exploration of the situation, control or direction of performance, understanding or mastery of intermediate requirements, and emotional responses. Solutions may be immediate, gradual, steady, or sudden. Although it is probable that certain patterns of solving are more characteristic of one mode of attack than of another, and that one mode of attack is more likely to lead to one kind of solution than to another, there are by no means invariable relationships of these kinds. Once these distinctions are understood it can be seen that much remains to be done, in a broad framework, to ascertain relationships between varieties of problem situations, modes of attack, processes involved in solving, and kinds of solution together with individual patterns in these respects.

Mental activities determined more by inner conditions have been included under the general heading of 'imagination'. Here we distinguished the phenomena of *imagery*, *imaginative thinking*, and *autistic thinking*.

Images are the recurrence of perceptual responses without the original overt stimulus. They may be vivid as in eidetic imagery and dreams, but are typically fainter, more unstable, and less realistic than the original perceptions.

In distinguishing between *imaginative* and *autistic thinking*, we sug-

gested that the former term be applied to situations in which the free mental processes of imagination are evoked primarily by external stimuli, and the latter term, to situations in which such processes are evoked or influenced primarily by internal stimuli. *Play* and *projective tests* are representative of imaginative thinking, and *fantasy*, *dreams*, and *wishful activity*, of autistic thinking. Although genetic aspects of imagination are still poorly understood, a tentative imagination gradient was presented as a way of indicating possible trends.

Although imaginative thinking was said to be determined by inner-need states, in general, a number of more specific functions were cited, including enjoyment, interpretation of stimulus objects, guidance of action, creative activity, and anxiety. Autistic thinking, similarly, has typical functions, such as wish fulfillment, escape, relaxation, explanation of reality, and preparation for realistic thinking. All these functions can be regarded as essentially normal, but each has its counterpart in psychopathology.

Fantasy, except where it is equated with responses in projective tests, has been less systematically investigated than have dreams. The reason may lie in the powerful effect of psychoanalytic dream theory, in terms of which dreaming can coherently be explained. Probably, fantasy could be brought into line with this theory, although certain special characteristics of fantasy would have to be satisfactorily taken into account. In connection with dreams, it was pointed out that the theory developed by Freud does not preclude the points emphasized by other investigators. It covers them all quite well.

The remaining aspect of autistic thinking, *wishful activity*, was discussed as that which frequently characterizes everyday life. It takes many forms not as readily identifiable as fantasy and dreams. Wishful factors often enter into apparently realistic thinking, but in indirect and disguised fashion.

Realistic and imaginative processes interplay most strikingly in *creative thinking*. Where it occurs, the individual is confronted by a problem to which there is no "correct" answer other than that achieved in order to satisfy the needs of the creator. Realistic considerations enter into creative thinking, because, in order to cope with the problem, the individual must attain a tangible product, whether it is a picture, a statue, a poem, a mathematical formula, a scientific theory, an invention, or something else. Another important set of realistic factors arises from the fact that the creative thinker is applying controlled skills and techniques to his medium, not simply engaging in free, random activity. On the other hand, imaginative processes are equally important in creative thinking. For one thing, there may be, at various stages, the free, plastic mental

activity characteristic of imagination, with recombination of previous sensory impressions. Further, creative thinking is determined by the inner needs of the person, and the creative product is as much an expression or satisfaction of those needs as it is a tangible object shaped in accordance with realistic requirements.

We found it necessary to revise the theory that four successive stages occur in creative thinking. Instead, it appears to agree more with the facts to conceive of preparation, incubation, illumination, and verification as four processes which occur in a shifting and complex pattern throughout the course of creative thinking, although now one, now another, may be dominant. These four processes have significant counterparts in the life history of the creator.

From creative thinking we turned, as a final task, to the clarification of *personalizing factors* in thinking. By so doing, we recognized the fact that thinking goes on in terms of the *mental context*, that organization which results from previous experience.

It was necessary to give a brief summary of the *internalization of experience*. Here we began with the physical, biological, cultural, and social determinants of experience and then summarized some of the principal characteristics of human learning. Processes of *individual acquisition* and *social learning* were distinguished. The former occur in situations in which learning takes place primarily through the child's own activities, and the latter, in situations where learning takes place primarily through the child's relations with other persons. Conditioning is the fundamental mechanism in both kinds of learning, constituting a necessary preparation for the later processes to which conditioning gives way. Exploration, manipulation, and repetitive experiences are the bases of individual acquisition. Introjection, suggestion, imitation, sympathy, and discipline are important in social learning. Long-range trends in learning were called "redirecting processes" including repression, sublimation, compensation, and anxiety. *Central affectional relationships* were stressed as vital factors in the internalization process.

General effects of the internalization process are apparent in the phenomena of *ethnocentrism* and *egocentrism*. Under the former heading, we included tendencies for persons who share membership in the same group to think similarly (because they have similar selective and regulative systems). It was necessary to point out, however, that persons who share group membership also think differently in important respects when they have different *roles*. Ethnocentric factors can be identified at various levels of inclusiveness. A convenient approach can be made in terms of cultural, subcultural, biological and social, and informal, direct-contact groupings.

By egocentrism, we meant those aspects of thinking which are determined by the development of individual selective and regulative systems. Psychoanalysis, in this connection, contributed to our understanding the notion of *mental dynamisms*. Commonly mentioned dynamisms are repression, introjection and identification, sublimation, condensation, displacement, projection, rationalization, reaction formation, undoing, isolation, regression, and denial.

The consequence of internalization is that the individual acquires complex selective and regulative systems which together make up the *mental context*. In order to define the character of this organization, we presented a theory which made use of the five terms "concept," "motive," "trait," "attitude," and "set." The stimulus-response direction of behavior was accounted for in terms of relationships among concepts, attitudes, and sets. The inner-outer aspect of behavior was attributed to motives, attitudes, and sets. The generality, or breadth, direction was explained by means of traits and attitudes. An attempt was made to clarify important problems arising in the measurement of attitudes.

Attention was devoted to *stereotypes*, a special class of concept, and to *prejudice*, a special kind of attitude. Systems of these kinds are relevant to social situations or symbols and have other special characteristics.

Finally, we indicated that the psychology of thinking needs to be extended into the realm of *public* thinking. Hence we briefly considered interpersonal relationships, mass media of communication, group discussion, and intergroup relations. As an example of public thinking, we developed the phenomena of *rumor* at some length.

Throughout the preceding pages we have made a concerted effort to bring together materials of diverse kinds, with special emphasis upon scientific research. We sought to organize these data and to give them theoretical coherence. In the course of our treatment, many more questions were raised than we were able to answer. It is our hope that future investigators can answer them.

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